



**Joint Project Manager (JPM) Chemical Biological Individual and Collective Protection Industry Day**

**22 July 2008**

**Baltimore, MD**

***Joint Science and Technology Office Filtration Initiatives***

- Mr. Chris Karwacki, JSTO

***IP & ColPro Filtration Capability Gaps***

- Ms. Christine Crabill, JPEO-CBD

***Reducing the Logistics Burden for IP and ColPro***

- Mr. Bob Wattenbarger, JPM IP and Mr. Dustin T. Green, Logistics Manager, JPMO-Collective Protection

***Test and Evaluation Methodologies***

- Ms. Amy Maxwell, JPM-ColPro
- Dr. Tom Sutto, JMP IP

***JPM-ColPro Product Directors***

- Mr. Nicholas Yura, JPM-ColPro

***JPM-IP Filtration Initiatives***

- Dr. Karen McGrady, JPM-IP

***Doing Business with the Government***

- Mr. Rich Alves, Army RDECOM Acquisition Center, Natick Contracting Division

***Joint Chemical Ensemble***

- Mr. Lowry Brooks, JPM-IP

# An Introductory Primer on Doing Business with the Government

Richard R. Alves Jr.  
Contracting Officer  
US Army RDECOM Acquisition Center  
Natick Contracting Division, Kansas Street  
Natick, MA 01760  
508-233-5922  
[richard.alves@us.army.mil](mailto:richard.alves@us.army.mil)

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# TOPICS

- Introduction
- Preliminary Matters/CCR
- Receiving Notification of Opportunities
- Government Contracting and the Small Business Community
- Becoming a GSA Vendor
- Methods of Doing Businesses with the Government

# Mission:

- The Natick Contracting Division (NCD) is a full service contracting organization managing integrated acquisition from basic research through production. Our mission includes research and development, services and supplies, base operations, spare parts, and item development. We contract for major soldier support systems ranging from body armor to air drop delivery with an annual contracting value in excess of \$1 billion.
- Our vision is to implement acquisition practices that reflect a world-class organization that provides the best services and products for our military partners.



# Organization:

- The Natick Contracting Division is part of the US Army Research Development and Engineering Command Acquisition Center (RDECOM AC), Aberdeen Proving Ground, Maryland. The division includes the Soldier Systems Branch and the Soldier Support Branch, as well as a small staff section.

# Preliminary Matters – Registering In the Central Contractor Registry

- **QUESTION: WHAT IS CENTRAL CONTRACTOR REGISTRATION?**
- **ANSWER: The Department of Defense implemented a policy whereby all contractors who wish to do business with any Federal agency must utilize the Central Contractor Registration (CCR). The CCR is a single repository for contractor data and updated annually by registrants. If you do not have an active CCR registration on file, in general, you cannot receive a contract award from any Department of Defense agency or receive payment on any existing contracts. Therefore, it is critical to your business that you update your CCR information annually. If you do not, your company information will be removed from the CCR database, and any contract payments due will be withheld until the registration is updated.**

# Preliminary Matters – Registering In the Central Contractor Registry

- **QUESTION: HOW DO I APPLY FOR CENTRAL CONTRACTOR REGISTRATION?**
- **ANSWER: To register in the CCR, you may use any one of the following methods: (1) mail completed registration application to the following address: Central Contractor Registration Assistance Center, 74 Washington Street, Suite 7, Battle Creek, MI 49017-3084; (2) fax your registration application to 616-961-7243; or (3) register directly with CCR through interactive World Wide Web application at <http://www.ccr.gov/>. If you intend to register by mail or fax, you may obtain a registration application by calling 1-888-227-2423 or 616-961-4725 (CCR Assistance Center).**

# Preliminary Matters – Registering In the Central Contractor Registry con't.

- Prior to completing your registration, you must provide your Taxpayer Identification Number (TIN) for IRS reporting purposes; obtain both a Data Universal Numbering System (DUNS) number and a Commercial and Government Entity (CAGE) Code. The DUNS number is a unique 9-character identification number provided by Dun & Bradstreet and can be obtained simply by calling 1-800-333-0505 or by direct application to <http://www.dnb.com>. The CAGE code number is administered by the DoD Defense Logistics Agency (DLA) and used in supply management. The CCR registration process provides details on obtaining a CAGE code or you can call DLA at 1-888-352-9333 for instructions.

# Preliminary Matters – Registering In the Central Contractor Registry con't.

- **QUESTION: HOW DO I RENEW, CHANGE, OR CANCEL AN ACTIVE REGISTRATION?**
- **ANSWER: The Internet is the recommended option for making changes or renewing your registration. Changes can be made by accessing the CCR homepage at <http://www.ccr.gov/> and clicking on “Update My Registration” or “Renew My Registration.” Enter your DUNS number and TPIN, AND click “Submit.” Make the necessary changes, and then click “Submit” for an update to register in the system. To submit a renewal with no changes, follow the same steps listed above, with the exception of making changes to your information. REMINDER: you must click “Submit” to activate the renewal, even if none of your information has changed.**



# Preliminary Matters – Registering In the Central Contractor Registry con't.

- To change or renew registration by mail or fax, send your DUNS number, your TPIN number, company name and changes (if necessary) to CCR Assistance Center, 74 Washington Street, Suite 7, Battle Creek, MI 49017-3084 or fax 616-961-7243 for update.
- To cancel an active registration: (1) go to <http://www.ccr.gov/>, click on “Update My Registration,” enter your DUNS number and TPIN and click “Submit”-- then on the next screen click “delete” to cancel your registration; (2) contact the CCR Assistance Center at 1-888-227-2423 or 616-961-4725; or (3) request cancellation by fax or mail.

# Maintaining Your Registration

- **REMEMBER:** You must renew your registration at least once a year. If you do not renew your registration, it will expire. An expired registration will affect your ability to conduct business with the Department of Defense. It will also affect any outstanding invoices being processed by the Defense Finance and Accounting Service. (That is, you will not receive payment until your registration is current.)

# RECEIVING NOTIFICATION OF GOVERNMENT CONTRACTING OPPORTUNITIES

- ◎ **QUESTION: HOW DO I ENSURE MY FIRM RECEIVES NOTICE OF ALL REQUIREMENTS THAT I MAY BE INTERESTED IN?**
- ◎ **ANSWER: Business opportunities are posted on the Internet, and you must review the applicable web sites for products and services of interest to you. NCD requirements are listed on our web site listed above. Federal procurement offices are required to announce proposed procurement actions over \$25,000 on General Services Administration's (GSA) Federal Business Opportunities (FedBizOpps) website. FedBizOpps is accessible at <http://www.fedbizopps.gov>. Opportunities are also posted on the Army Single Face to Industry (ASFI) at <https://acquisition.army.mil/asfi/>.**

# Receiving Notification of Opportunities

- ◉ **QUESTION: IN WHAT FORMAT DOES THE CONTRACTING OFFICE ISSUE SOLICITATIONS?**
- ◉ **ANSWER: Solicitations are issued in an electronic format and are available for download. Instructions to download solicitations are contained on the websites (either the installation homepage, FedBizOpps or ASFI).**
- ◉ **QUESTION: HOW ARE AMENDMENTS TO AN ELECTRONIC SOLICITATION ISSUED?**
- ◉ **ANSWER: Amendments are issued in the same manner as the solicitation, by posting on ASFI and installation contracting homepage when available. The method of posting amendments may vary by installation but all should be listed in ASFI under the solicitations and marked for easy access.**
- ◉ **NOTE: IT IS THE RESPONSIBILITY OF OFFERORS TO CHECK FOR AMENDMENTS TO SOLICITATIONS. THE CONTRACTING OFFICE WILL NOT NOTIFY YOU. RECOMMEND CHECKING FEDBIZOPPS, ASFI, AND ANY HOMEPAGE.**

# Government Contracting and the Small Business Community

- ◉ **QUESTION: WHAT IS THE GOVERNMENT'S POLICY AND COMMITMENT TO THE SMALL BUSINESS COMMUNITY?**
- ◉ **ANSWER: The Federal government's commitment is to nurture and support all facets of the small business program to include the SBA 8(a) program, small disadvantaged businesses, women-owned businesses, HUBZone companies, veteran-owned businesses, and other small businesses.**
- ◉ **QUESTION: WHAT ARE SET-ASIDE PROGRAMS?**
- ◉ **ANSWER: A set-aside program allows an acquisition to be solicited from a specific small business area. Set-Aside programs include Service Disabled Veteran Owned Small Businesses, SBA 8(a), HUBZone, and Total Small Business. See Website <http://sba.gov/> for detailed information on each of the types of businesses.**



# Government Contracting and the Small Business Community, Con't.

- ⦿ **QUESTION: ARE THERE ANY SPECIAL PROGRAMS OR IS THERE ANY SPECIAL ASSISTANCE FOR WOMEN OWNED FIRMS?**
- ⦿ **ANSWER: The SBA operates the Office of Women's Business Ownership. The OWBO promotes the growth of women owned businesses through programs that address business training and technical assistance. The SBA's website includes information provided by the Office of Women's Business Ownership, and can found at [www.sba.gov/aboutsba/sbaprograms/onlinewbc/index](http://www.sba.gov/aboutsba/sbaprograms/onlinewbc/index)**

# Government Contracting and the Small Business Community, Con't.

- **QUESTION: WHAT IS THE HUBZONE EMPOWERMENT CONTRACTING PROGRAM?**
- **ANSWER:** It is an initiative designed to stimulate economic development by providing federal contracting opportunities to small businesses located in eligible areas. A HUBZone is a “historically” underutilized business zone. It is a “place-based” federal contracting program serving new market communities with low income or high unemployment. The program provides both prime contract and subcontract benefits. Companies must be certified by the Small Business Administration (SBA) to participate in the program. At the HUBZone website (<http://sba.gov/hubzone>), you can determine whether your firm is located in a qualified HUBZone, and if so, you can apply for participation in this program.

# Government Contracting and the Small Business Community, Con't.

- ⦿ **QUESTION: WHAT IS THE SMALL BUSINESS 8(a) PROGRAM?**
- ⦿ **ANSWER: The 8a program is a Congressionally mandated socio economic program that provides preferred status to firms determined to be socially or economically disadvantaged. The program provides for direct awards without competition to these selected, qualified firms. See <http://sba.gov/> for details.**

# BECOMING A GSA VENDOR

- ◉ **QUESTION: How Do I Get On The General Services Administration (GSA) Schedule or Become a GSA Vendor?**
- ◉ **ANSWER: Recommend you visit website <http://www.gsaadvantage.gov/> for information on the General Services Administration (GSA) federal program. GSA homepage <http://www.gsa.gov/> has a wealth of general information that will assist you in your efforts to become a GSA vendor. The phone number for the GSA MAS Helpdesk is 800-488-3111.**

# Methods of Doing Business with the Government

## *Contracts*

- **An agreement, enforceable by law, between two or more competent parties, to do or not to do something which is not prohibited by law, for a legal consideration. A contract is a mutually binding legal relationship that obligates the seller to furnish supplies or services (including construction) and the buyer to pay for them.**



# Methods of Doing Business with the Government, Con't

## *Broad Agency Announcement (BAA)*

- The BAA is an open request for proposals. Its purpose is to fulfill requirements for scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge and understanding as a means of eliminating current technology barriers. It is for the acquisition of basic and applied research and that part of development not related to the development of a specific system or hardware solutions.
- The BAA is revised each year to reflect the Natick Soldier Center's (NSC) R&D requirements. The solicitation is divided into several topic groups, e.g., clothing, food service, etc. Each topic area describes technologies and products that are of interest to the NSC and gives a point of contact for that area. Detailed instructions on preparation and submission of a proposal and evaluation criteria are included in the official BAA.
- The BAA will fund programs, which meet NSC R&D needs and show sufficient technical promise.
- The current BAA is available online at: <https://www3.natick.army.mil>.
- If you are unable to access the BAA online, a hard copy may be obtained by faxing a request to (508) 233 -5286

# Methods of Doing Business with the Government, Con't.

## *Small Business Innovation Research (SBIR)*

- The Army SBIR program is designed to: stimulate technological innovation in the private sector; strengthen the role of small business in meeting DoD research and development needs; foster participation by disadvantaged persons in technological innovation; and increase technology transfer and commercial application of DoD supported research and development results. Each Army and Department of Defense R&D organization includes topics in the SBIR solicitation requesting proposals, which will be evaluated for possible funding. The Army SBIR solicitation opens in July of each year through the Defense Technical Information Center, and is announced in the Federal Business Opportunities list at <http://fedbizopps.gov>. This solicitation covers not only the NSC, but also the entire Army. The SBIR solicitation can be found online at: <http://www.acq.osd.mil/sadbu/sbir/>.
- Program contact at Natick:(508) 233-4223

# Requests for Information (RFI)

- A process used to collect written information about the capabilities of various suppliers.
- 
- Assists the Government in identifying potential sources.
- 
- A white paper (with specified page limit) explaining the capabilities of the products and components will be requested
- 
- Unless otherwise noted, responses to RFIs are strictly voluntary and will not affect ability to submit an offer if solicitation is released.
- 
- Potential Topics of Interest for JPM-IP:
- 
- adsorption and/or neutralization of vapor chemical hazards – Chemical Warfare Agents (CWAs), Non-traditional Agents (NTAs) and/or any Toxic Industrial Chemicals (TICs)
- 
- removal and/or neutralization of vaporous and aerosolized chemical and biological agents
- 
- concepts to reduce the logistics burden of the currently fielded masks or the next generation system either using existing respiration and ocular technologies or advanced technologies.
- 
- concepts to improved human factors performance such as reduction in breathing resistance, cartridge profile, and total weight.

# QUESTIONS

Unclassified



# Respiratory and Ocular Protection Integration Issues and Advanced Concepts

## JPM-IP / JPM-CP Industry Day

**Mr. Lowry Brooks**

**JPM-IP Future Acquisition Team**

**July 22, 2008**



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# Outline

- **Traditional Challenge Levels**
- **Evolving Challenge Levels**
- **Traditional Approaches**
- **JPM-IP Vision and Strategy**
- **Joint Chemical Ensemble**
- **Current Integration Efforts**
- **Concepts**





# Keep in mind...





# Traditional Challenge Levels

## A HISTORICAL PERSPECTIVE OF THE LIQUID AND VAPOR CHEMICAL AGENT CHALLENGE LEVELS IN CHEMICAL DEFENSE RDT&E

**Joint Decontamination & Protection  
Conference & Exhibition**

**October 2007**

**JAMES C. BYRNES**  
JRAD, Inc.

50 TECH PARKWAY  
STAFFORD, VA 22556

240.377.1137  
[jbyrnes@jrad.us](mailto:jbyrnes@jrad.us)





# Evolving Challenge Levels

- Recently completed and ongoing studies on operationally relevant challenge levels and mission profiles
- Paradigm is beginning to shift from historical challenge level requirements to a capabilities-based view with intelligent Operational Risk Management (ORM) decisions used to bound tradespace.
- Efforts to reconsider challenge levels in the light of the likely threats of tomorrow are underway
- The difficult part is developing the new rationale, adjudicating the position among the Services, and weighing the risks
- CBD community needs to come to consensus in the tradeoff between operational effectiveness and risk exposure



# Evolving Challenge Levels

The Changing Nature of the Threat



PRESENTED TO:  
IP / DECON / CP Conference  
Virginia Beach, VA

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## Protecting the Warfighter

STEPHEN V. REEVES  
Major General, USA  
Joint Program Executive Officer

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# Traditional Separate Approaches

Individual  
Service  
Soldier  
Protection  
Approach



CB  
Component  
Integration  
Approach



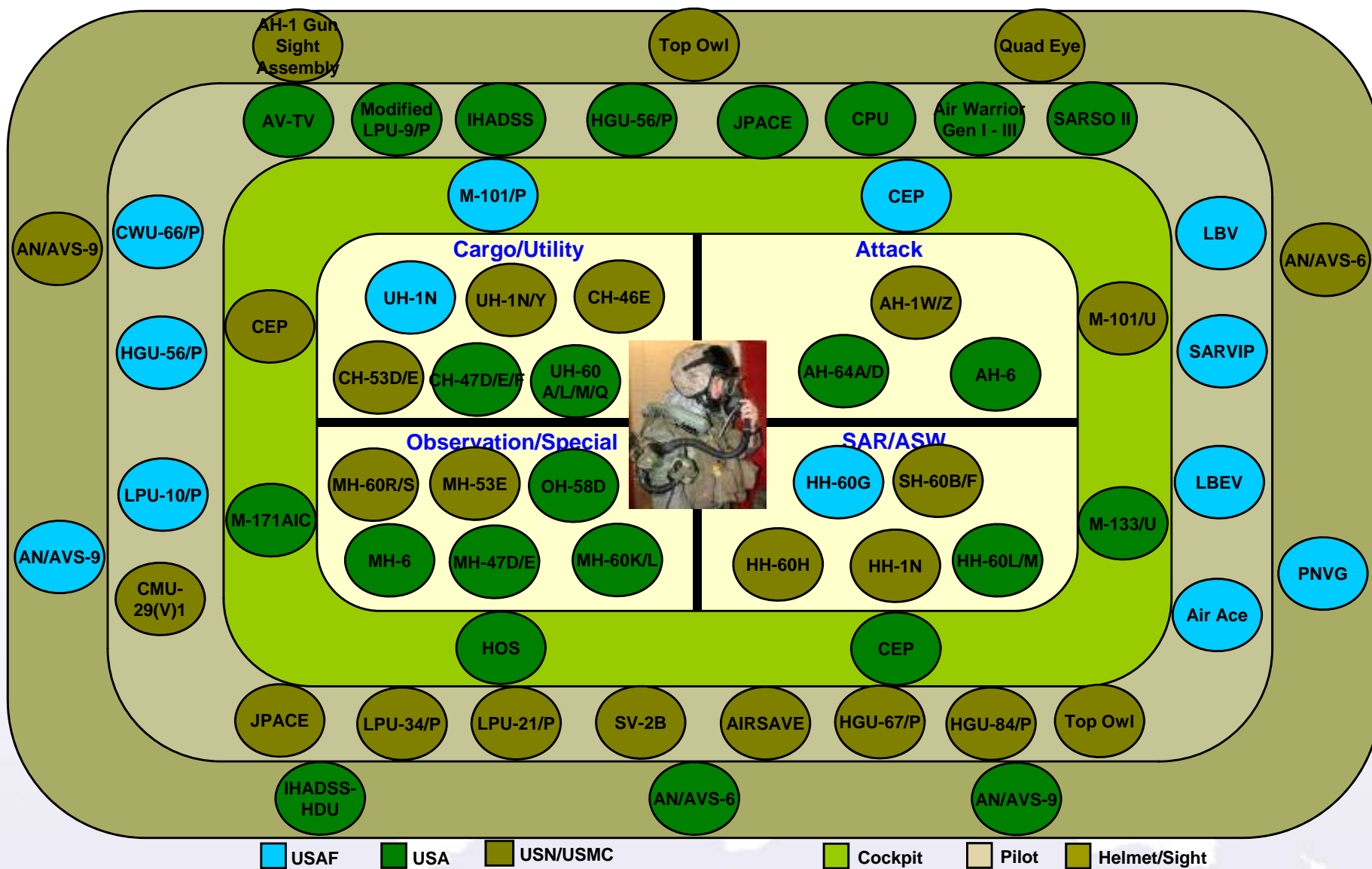
Encumber:

1. To put a heavy load on; burden
2. To hinder or impede the action or performance of





# Integration Challenge: JSAM Rotary Wing Interfaces



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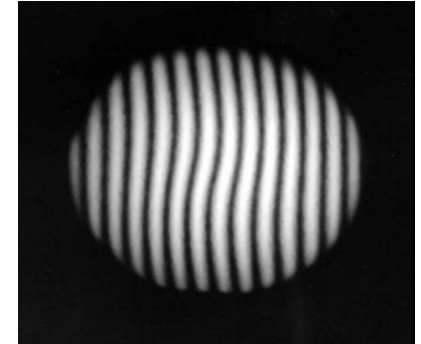




# Integration Issues

- **Optics**

- Refractive power and distortion in the critical viewing area
- False visual cues and nausea reported during day flights



- **Head Mobility**

- Interference with body armor and flotation collar
- Limited range of motion



- **NVG Integration**

- Not rated safe to fly at night due to limited head mobility
- NVG displacement caused by helmet / hoodring interface

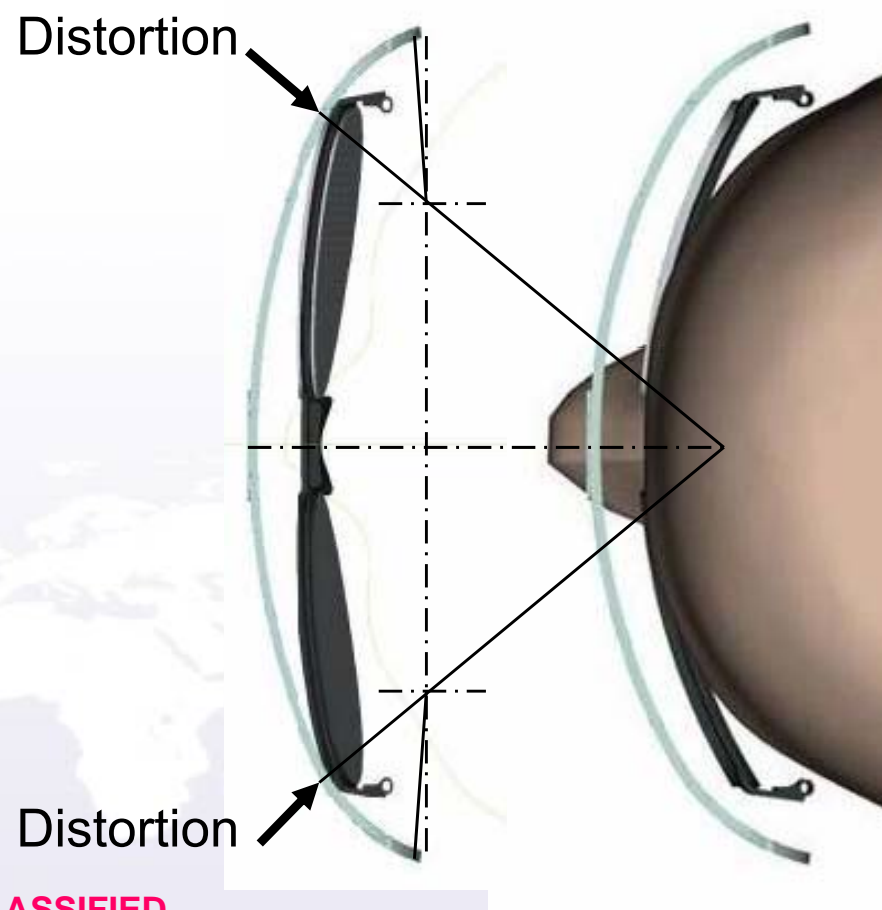


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# Integration Issue – Optics

- Mutually agreed to a single lens design that was a compromise for
  - NVG use
  - Spectacle use
  - Helmet integration



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# Integration Issue – Head Mobility



## Hard Body Armor Chest Plate

- The hard body armor plate in the chest reaches to the top of the sternum.
- If the plate could be lowered when flying in MOPP 4, significant head mobility gains could be realized.
- Initial feedback from user community is to NOT compromise ballistic protection (i.e. lowering chest plate).



# Integration Issue - NVG A Competition for Limited Real Estate



**Will compatibility with JSAM drive unacceptable trades in the MACH helmet edge roll?**





# Integration Issue – Torso

## A Competition for Limited Real Estate



**Filter Location  
Interferes With  
Stick & Throttle  
Operation**



# JPM-IP Vision

***To provide enhanced ocular, percutaneous and inhalation protection against CB threats thru a modular family of systems solution while maintaining the Warfighters' ability to shoot, move, fly and communicate.***

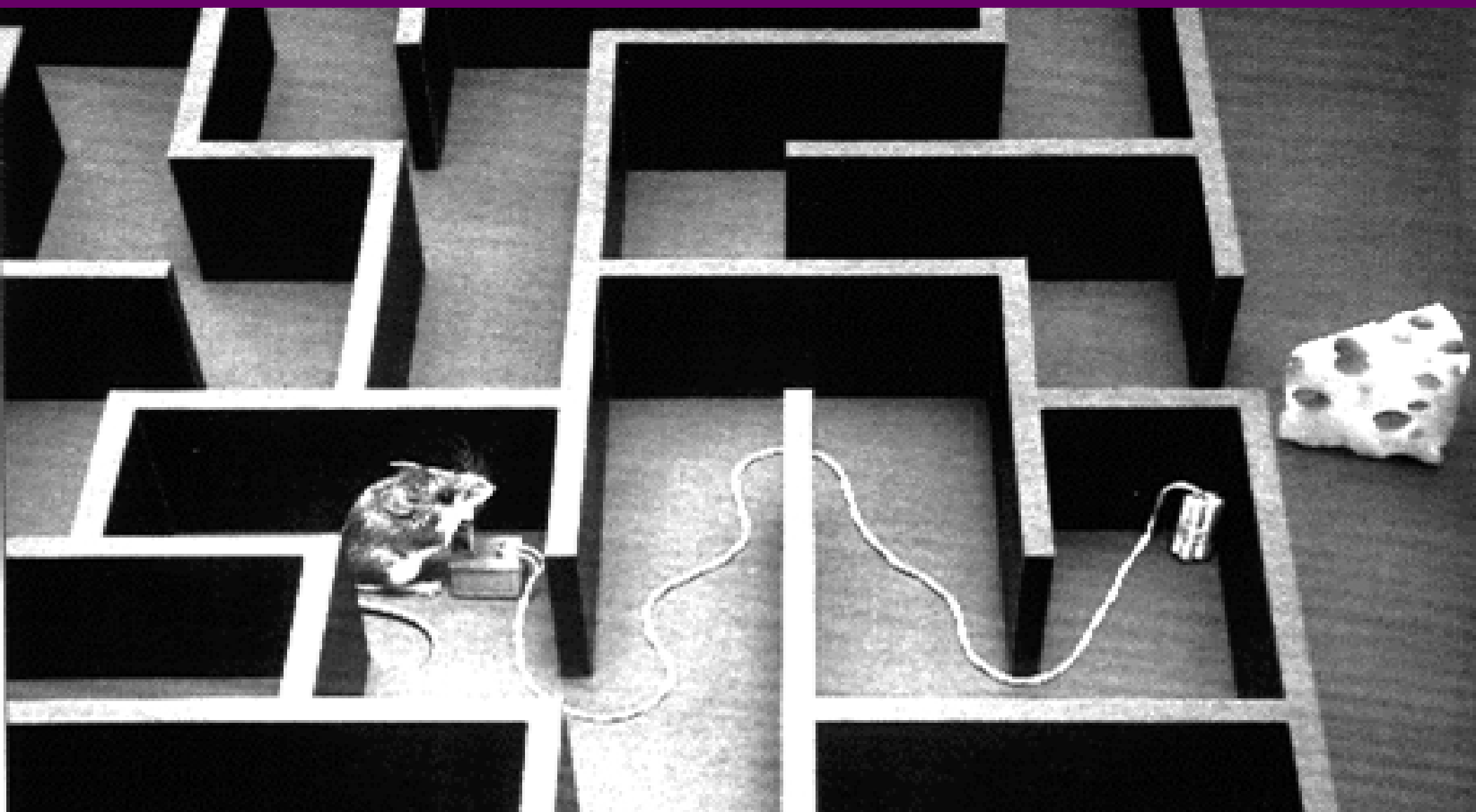
- **Guiding Directives**

- **CBRND Capabilities Baseline Assessment (CBA)**
  - **FAA/FNA/FSA**
- **Quadrennial Defense Review**
- **DoD Program Strategy Guidance**
- **JPEO-CBD**

**“The far-term goal is to develop a combat uniform that possesses CBRN protective capabilities and IPE tailored towards specific user communities that require additional protection.” – FNA/FSA Chapter 13, pg.4 (et al) Tactical Shield Tasks**



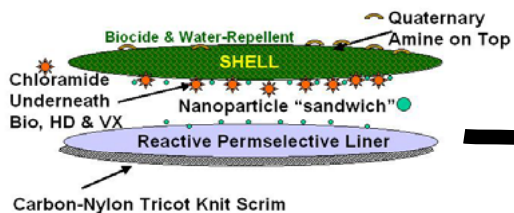
# New Approaches







# Integrated Ensembles



*Integrated Fabrics*



*Clothing Design*

**Integrated  
System of Systems  
Design  
Environment**



*JCE*

*Mission Specific Clothing  
Modules and Integrated  
Mask/Helmet ....  
with optimal integration  
among components*



*Respirator and Helmet Design*

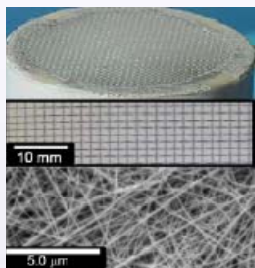
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*Human  
Performance*



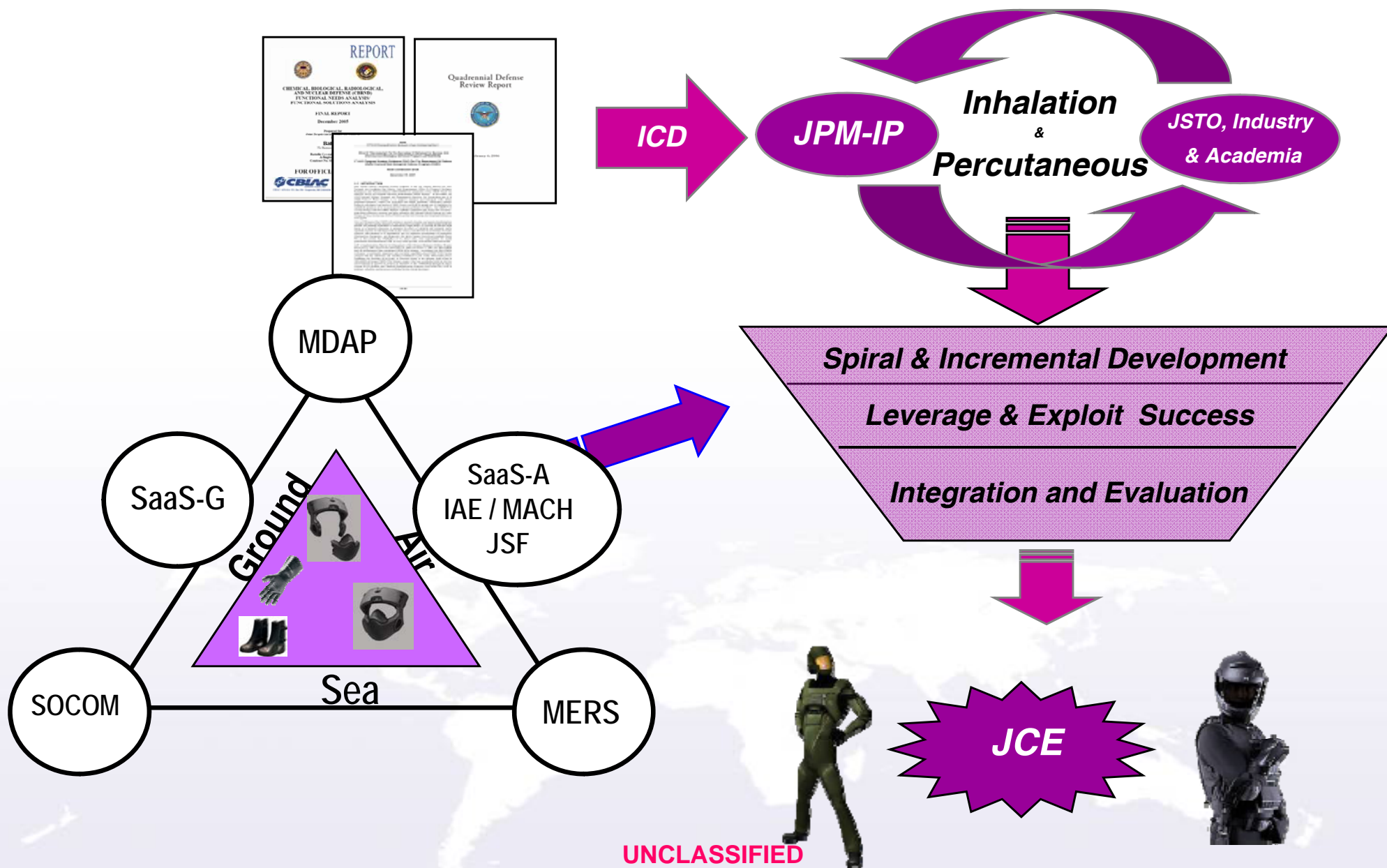
*Service  
Specific  
Equipment  
Design*



*Air Purification  
and low profile  
filters*



# Acquisition Strategy





# JPM-IP Overarching Obstacles

- **Integration and synchronization with Service uniform and ballistic protection developers**
- **Timely JCIDS documentation**
- **Operational realism and appropriate ORM**
- **Rapid and timely technology transition**
- **Proactive T&E strategies**
- **Introduction of more mission-tailored IPE to inventory**
- **Emerging requirements supporting WMD Interdiction and Elimination Operations**



# Approach

- **JCE approach:**
  - Grounded in OSD Strategic Guidance
  - Framed around JRO-published CBRN CBA
  - Grounded in Operational Realities
- **Multiple evolutionary avenues being pursued for revolutionary solutions**
  - LCBPG allow development of capabilities that will feed into JCE
  - JSTO Projects/Industry Partners

**Evolutionary gains, meeting operational needs, transitioned to JCE program of record**



# Joint Chemical Ensemble Program Vision

**Through emerging technology, information and a disciplined but flexible approach to systems development improve respiratory and percutaneous protection against an ever-expanding spectrum of agents with significant reductions (or elimination if possible) of physiological effects such as heat stress, breathing resistance, etc. while achieving significant reductions in life cycle cost.**





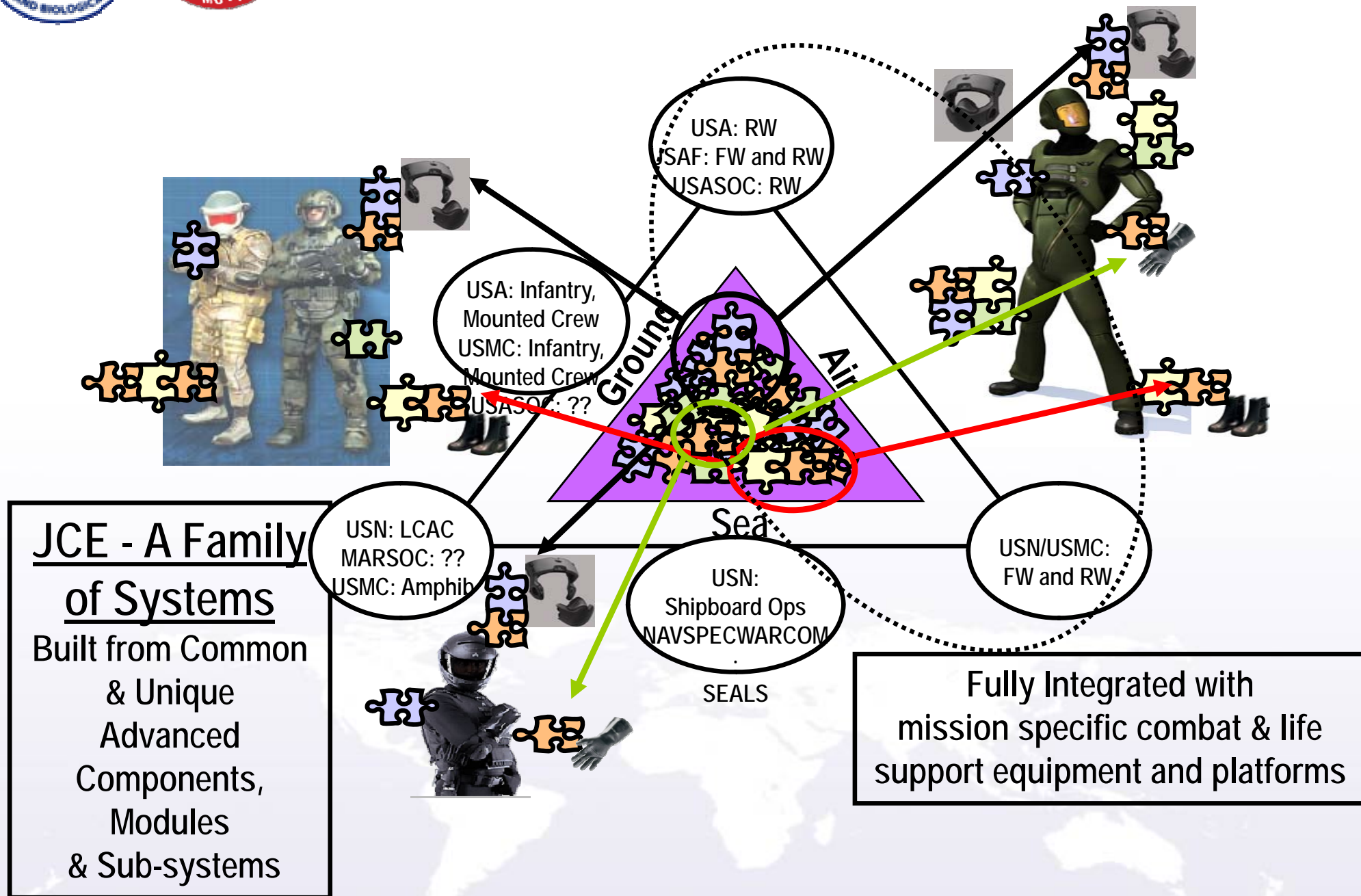


# Joint Chemical Ensemble

- Fully integrate Chem-Bio protection into the combat duty uniform tailored for specific missions as required by the warfighter.
  - Head-to-toe solution encompassing both percutaneous and respiratory and ocular protection.
- Foundation:
  - 24 S&T efforts scheduled for transition between 4QFY09 and 4QFY12 support JCE.
    - 13 percutaneous, 11 respiratory and ocular protection (including filtration).
  - JSTO studies examining the physiological and psychological effects of IPE on the individual warfighter.
    - Quantify the degree of thermal burden reduction and performance degradation caused by the wear of IPE.
  - Technology Demonstration
  - Technologies from industry as viable solutions



# JCE Notional Commonality



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# Notional System Relationships

**FOS**

**MISSIONS AREA  
SYSTEMS**

**SPECIAL MISSION**

**RW AVIATION**

**GROUND ARMOR**

**SHIPBOARD**

**FW AVIATION**

**SYSTEM  
COMPONENTS**

**SUIT**

**HANDWEAR**

**FOOTWEAR**

**MASK**

**SUIT**

**HANDWEAR**

**FOOTWEAR**

**MASK**

**MASK**

**SUIT**

**HANDWEAR**

**FOOTWEAR**

**MASK**



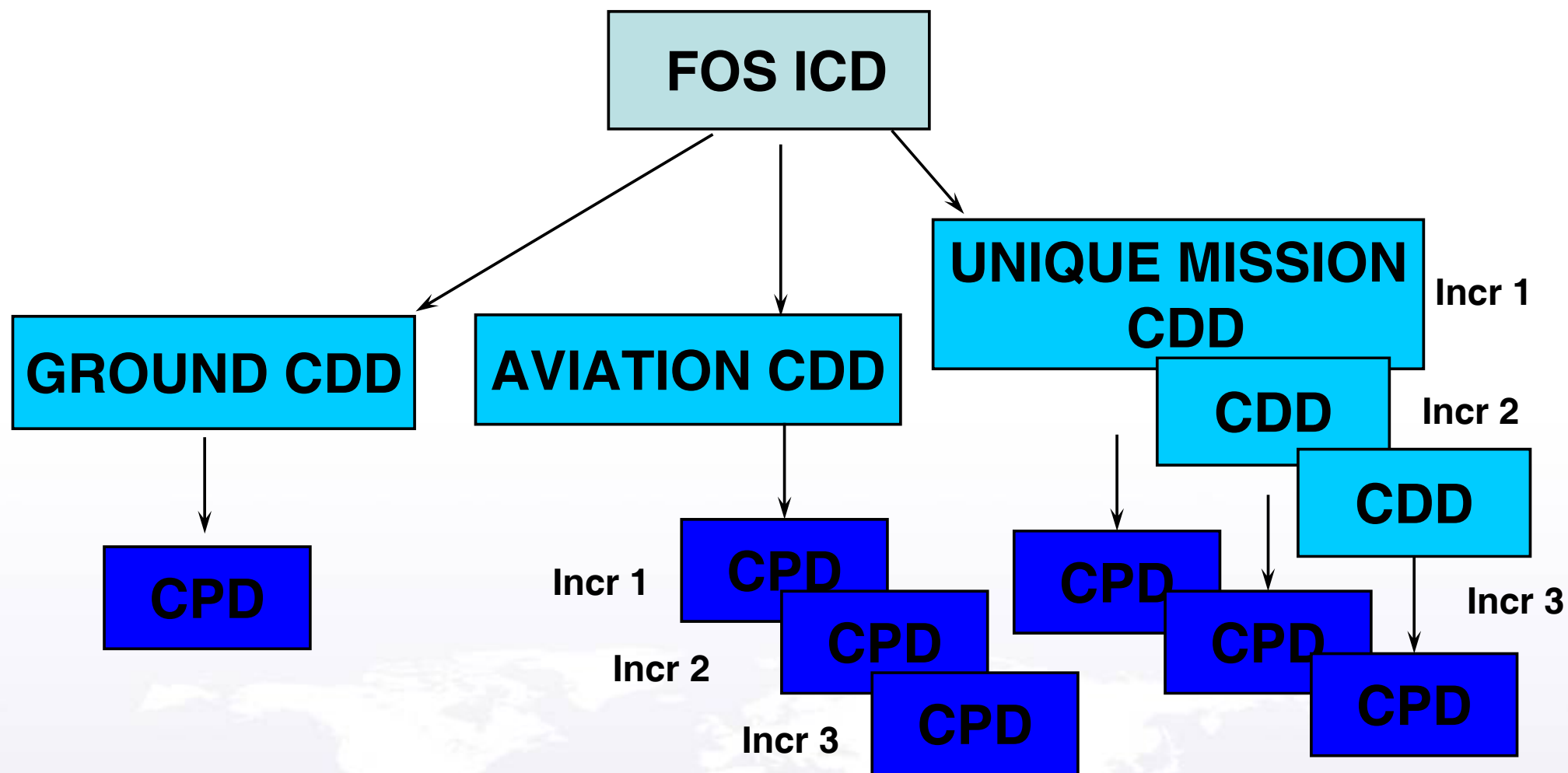
# Acquisition Strategy



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## Capability Document Relationships (Notional)



- Draft ICD in KMDS
- JPM-IP pre-milestone A activities to date have been driven by the CBRND Capabilities Baseline Assessment (CBA), which includes the FAA, FNA and FSA (FOUO)





# JCE Improvements

- **Respiratory / Ocular Protection**
  - Protection Against Toxic Industrial Chemicals/Materials (TICs/TIMs)
  - Improved Seals/Integration with Suit/Helmet
  - Residual Life Indicator
  - Operate at Higher Flow Rates
  - Longer Life, Lighter and Smaller Filters
- **Vision and Comfort**
  - Increased Field-of-View
  - Reduced Breathing Resistance
  - Reduced Lens Fogging
  - Reduced Lens Distortion
  - Minimize Physiological Burden
    - Heat Stress and Sweat Management



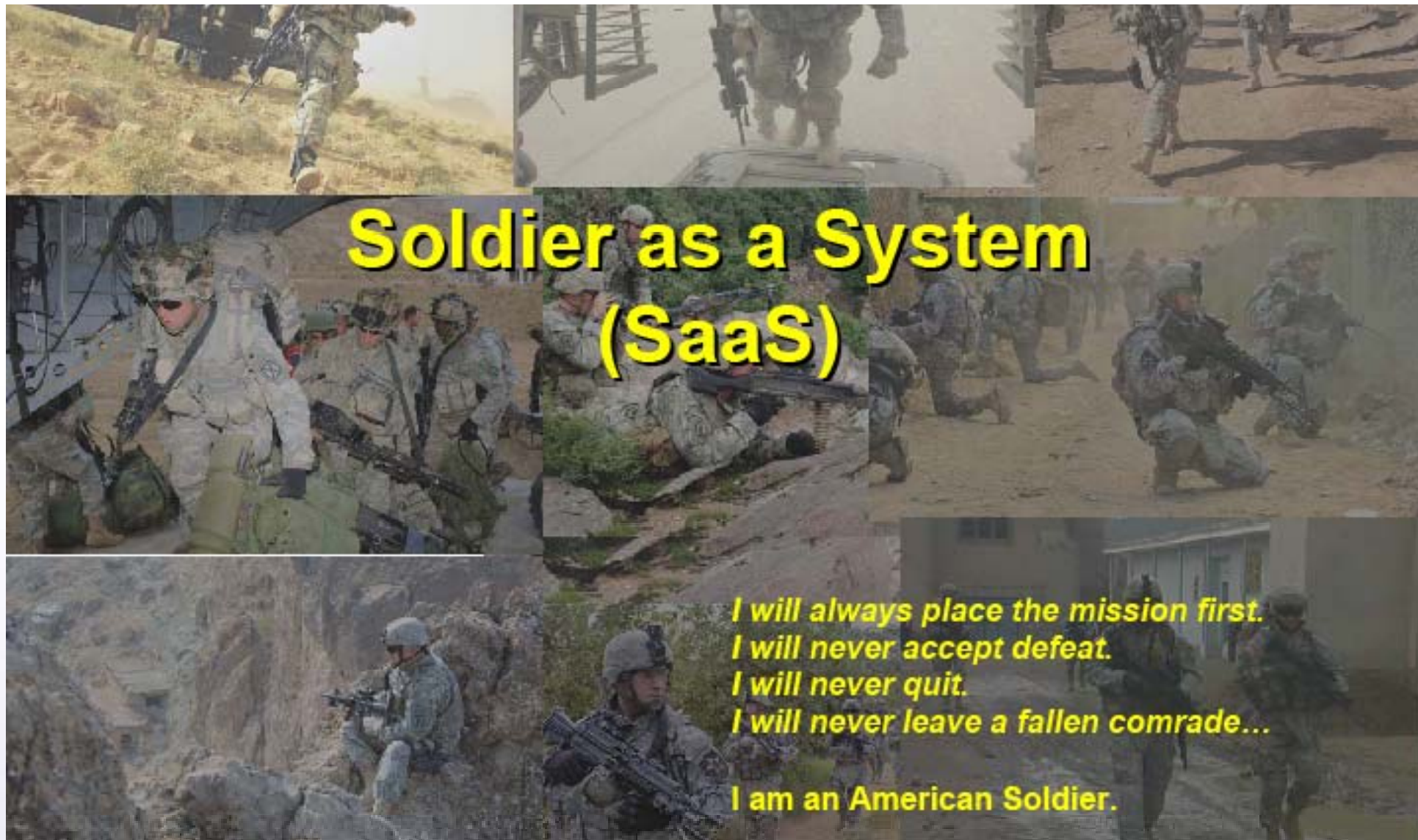


# How Hard Can That Be?





# Soldier Load







# Opportunities

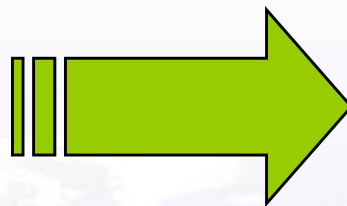
- **Integrated Aircrew Ensemble (IAE) - USAF**
  - JPM-IP influencing CDD based on challenge studies; potential for JPM-IP module or technology insertions
- **Modular Aircrew Common Helmet (MACH) – USAF**
  - Seeking opportunity to influence as basis for integrated mask/helmet
- **Soldier as a System (SaaS)-Air, Ground – USA**
  - Will leverage JPM-IP efforts to provide Next Gen CB solution
  - Key System Attributes demonstrated in MOPP-IV
  - Transition Technology via IP Technology Demonstration
- **Joint Service Advanced Laser Eye Protective Visor – USA, USN/USMC**
  - Opportunity to influence and ensure compatibility initially with JSAM and to integrate capability into combined mask /helmet of the future
- **Combined JHMCS / NVG – USN / USMC, USAF**
  - Opportunity to influence and ensure compatibility initially with JSAM and to integrate capability into combined mask / helmet of the future





# IP Technology Demonstration

- *Focus on revolutionary technologies and new materials*
- *Demonstrate an integrated low-burden concept in FY2010*
- *Use thermal burden as an independent variable*



**Mitigation –**



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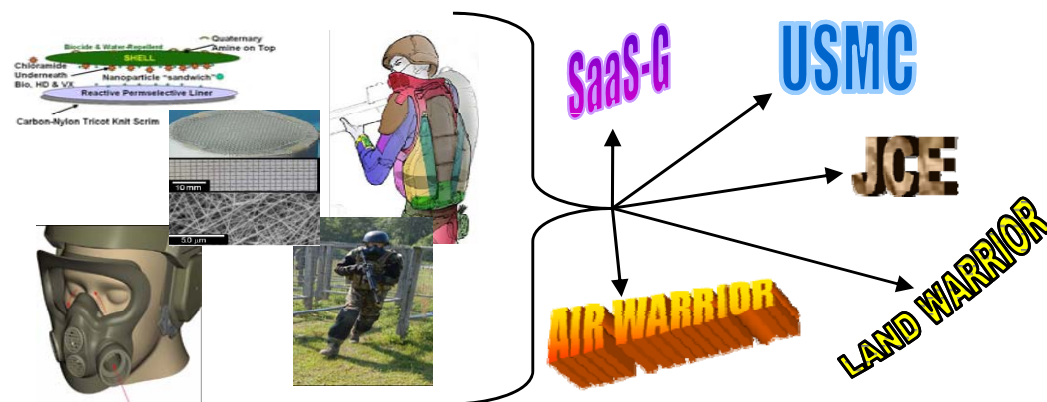
# Demonstration Objectives

- Demonstrate integration of CB individual protection technologies into a ground Warfighter "system" (SaaS-G)
  - CB Protection into duty uniform
  - **Respiratory/ocular protection into helmet**
  - CB sensor and warning data into Soldier network
- Break new ground for lowering physiological and cognitive burden
  - Investigate Trade-space: Develop and demonstrate a CB protective system thermal performance similar to the Flame Resistant (FR) Army Combat Uniform (ACU)
- Assess trade-space (thermal, CB, human performance, doctrine, cost) and demonstrate "What we could do" to help users and developers define future requirements
- In FY11 transition demonstrated technologies and lessons learned to Joint PM- Individual Protection's (JPM-IP) and PM- Soldier Warrior (PM SWAR) and PM- Soldier Equipment (PM SEQ)
- Address other platforms (air/mounted) beginning in FY11



# Future CB Ensemble Technology Demonstration

## Integrated CB Ensembles



### Purpose:

- **Demonstrate one or more concept integrated CB Warfighter system to increase mission performance and CB related Situation Awareness (SA) and to reduce thermal & physiological burden**

### Results/Products:

- **SaaS-G system designs(1-3) & prototypes (3-5 per design) integrated with CB technologies**
- **Data / evaluations assessing:**
  - **Mission performance, user acceptability, CB and network integration**
  - **Trade-space**

### Payoff:

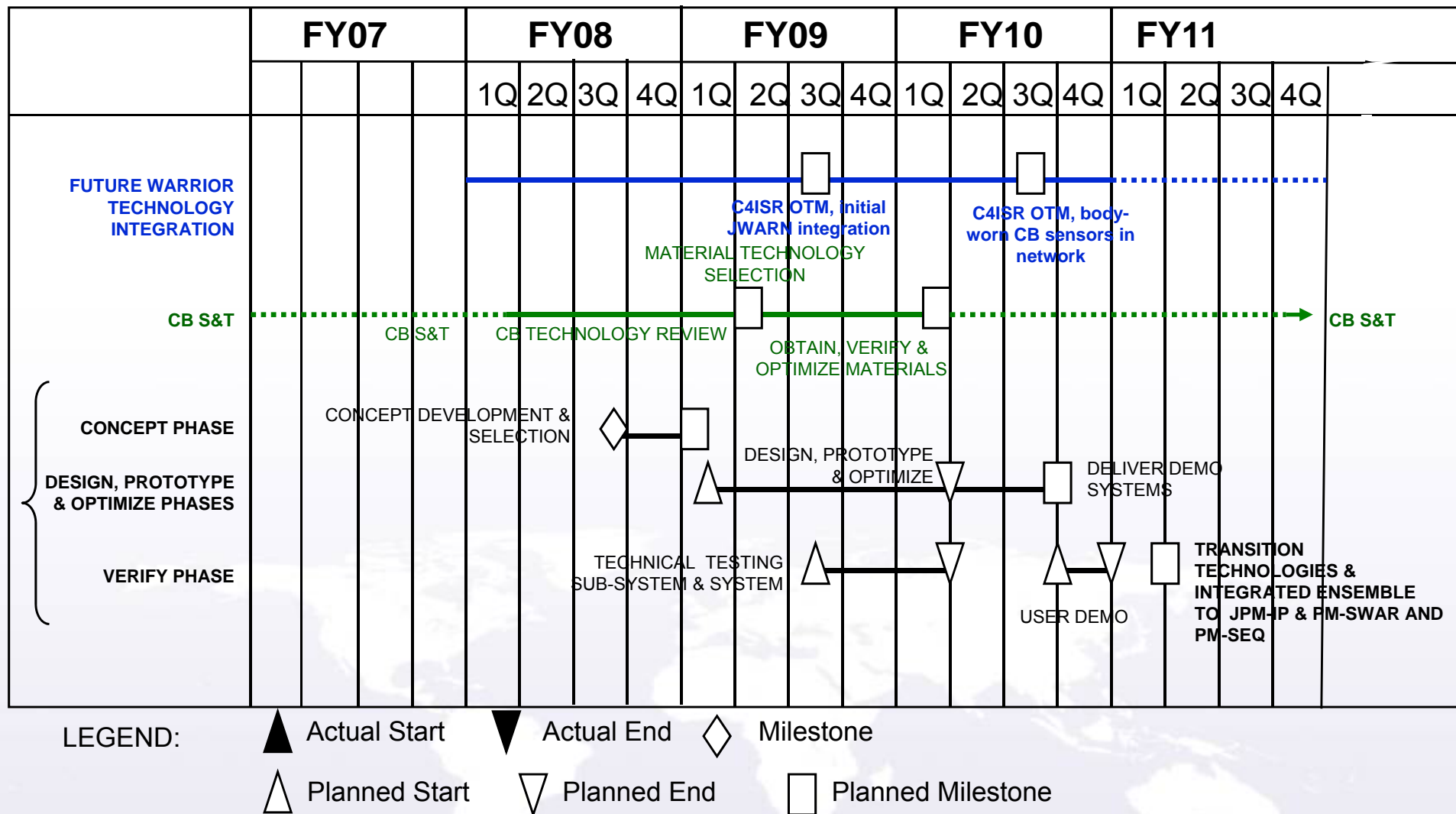
- **Improve operational mission performance of Warfighter in CB contaminated environment**

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## Future CB Ensemble SaaS-G Technology Demonstration

This schedule needs to be made current



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# SaaS-G CB Requirements

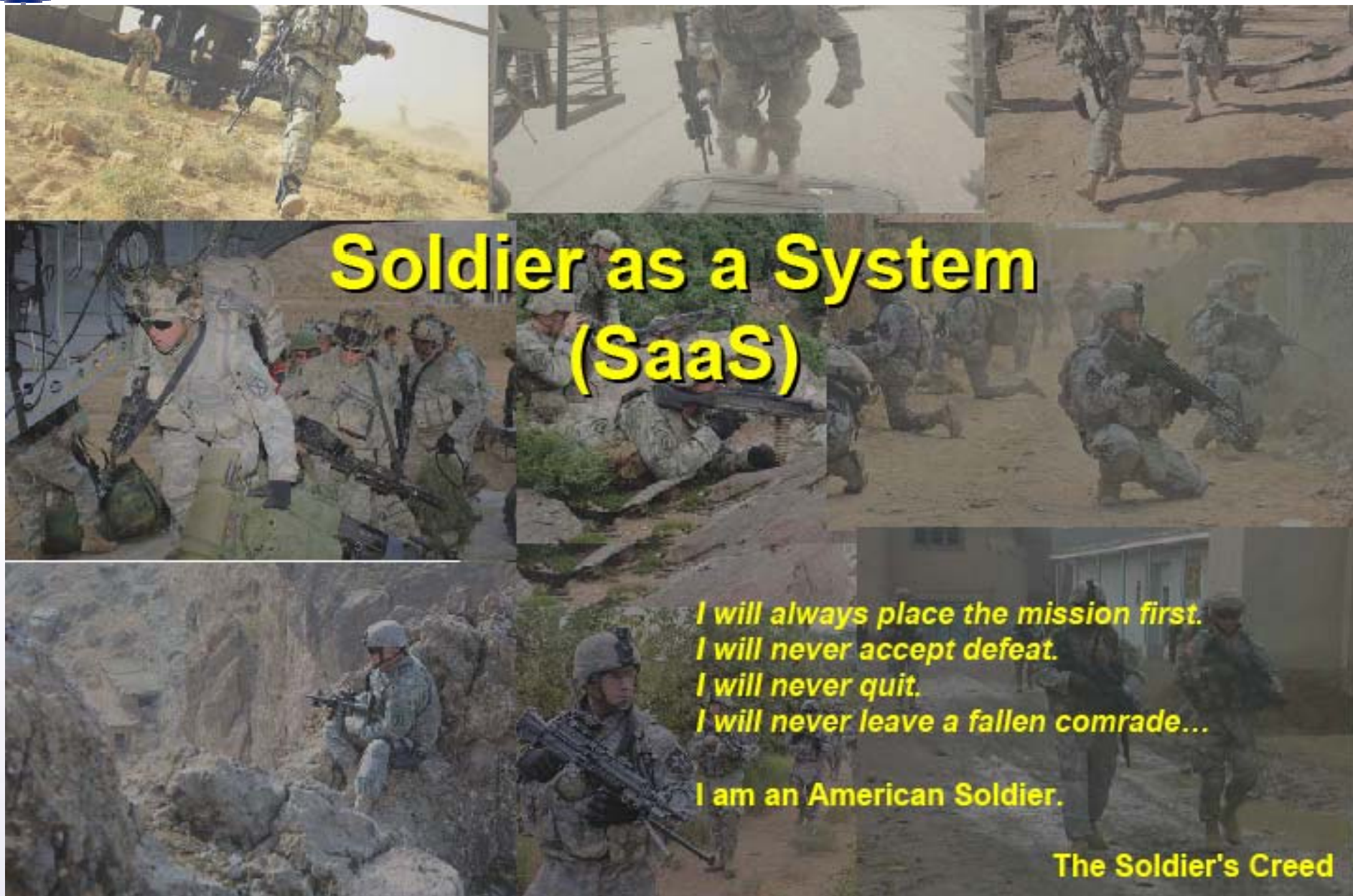
- GSS CDD includes CB protection requirements
  - **GSS CB requirements will be addressed beyond FY10**
  - **Opportunity to leverage and integrate CB S&T into GSS**

## Examples of GSS Desired Future CB capabilities

- Improved Passive Thermal Management ( $Im/Clo > 0.2$ ) (6.2.7.12)
- Active Thermal Management (Active Cooling  $> 150\text{ W}$ ) (6.2.7.12)
- Waste Management capability (6.2.2.8.10)
- Positive Respiration (6.2.2.8.6)
- Positive Pressure Suit (6.2.2.8.6)
- Built-in CB Detector/Monitor (6.2.2.8.20)
- Enhanced CB closures (.....)
- De-contaminable Ensemble for re-use (.....)
- Ability to re-fill Hydration system in CB environment (6.2.2.8.17)



# Soldier as a System Concept







# Air Warrior/Air Soldier System



**Joint Service  
Aircrew Mask  
(JSAM)**



**Microclimate  
Cooling System**



**Air Warrior Body  
Armor**

**Fire Resistant  
Envir. Ensemble  
(FREE)**



**Night Vision  
Goggles**



**Aircrew Wireless  
Intercom System  
(AWIS)**



**Combat Survivor Evader  
Locator (CSEL) Radio**

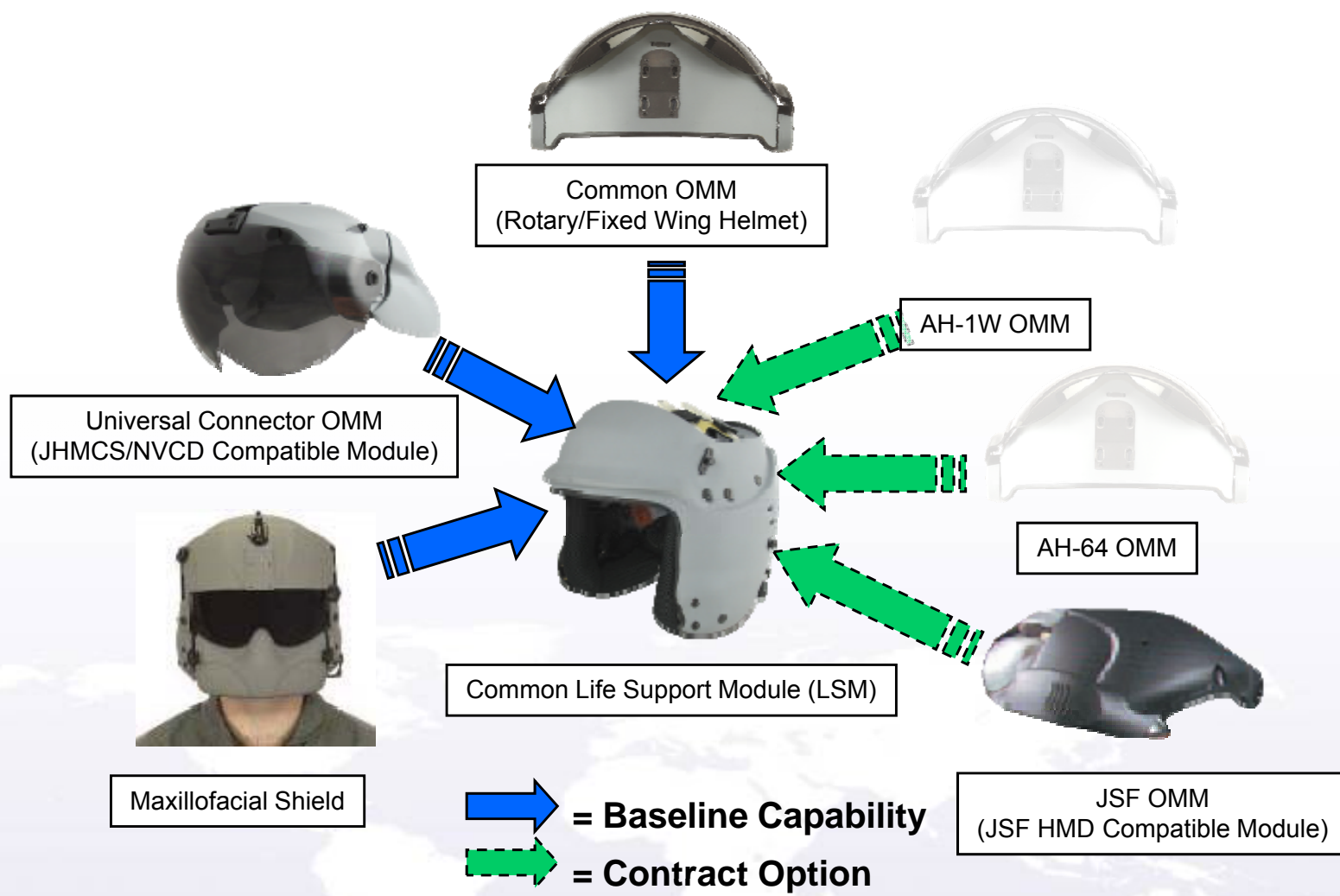


**HGU-56/P/IHADSS  
Helmet and Bag**



# MACH System Overview

## System View







# MACH System Overview



Common



Common w/MBU-23/P O2 Mask



Common  
w/Maxillofacial Shield  
and Dual Visor Kit



Common w/MBU-23/P  
O2 mask and AN/AVS-  
9 NVGs



Universal Connector  
w/MBU-23/P O2 mask  
and JHMCS Module

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# MACH

- **JPM-IP Vision:**

- Interface for future CB platform built into MACH from ground up



***MACH compatibility with legacy and concurrent respirator development***



# JPM-IP / MACH Approach

- **Combined Mask Helmet Study**
- **Attempt to overcome historical issues plaguing separate helmet and CB development efforts and offer solutions for a truly integrated system for the future**
- **Establish the groundwork in MACH for executing the JPM-IP vision for integrated mask/helmet**
- **Supporting MACH development with lessons learned regarding backwards compatibility**
- **MACH program is willing to add combined mask / helmet effort to existing contract**
- **Deliverables (w/ Government partnership)**
  - Study and analysis
  - Incorporation of lessons learned
  - Development of prototypes
    - Near term
    - Mid term
    - Long term





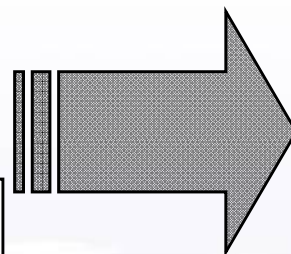
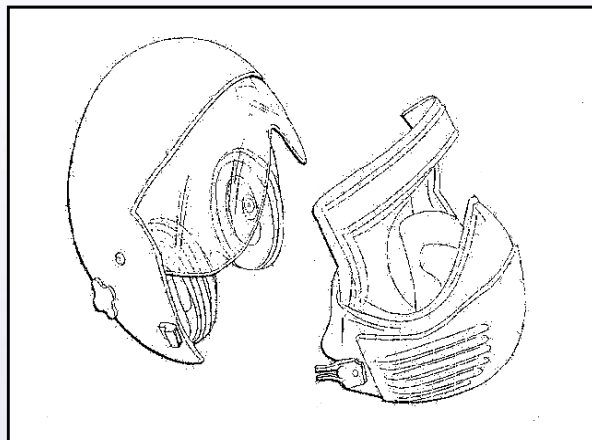
# Integration Concept

## Module Approach



### Potential Advantages:

- Improved Protection
- Improved Filter Capacity
- Reduced Breathing Resistance
- Improved Visual Field-of-View
- Improved Comfort
- Improved Compatibility
- Improved Center-of-Gravity



- ✓ Overall Comfort and Fit
- ✓ Unblown Protection/Defog
- Faceplate Stowage
- Protection w/o Helmet
- Overall Weight/Bulk



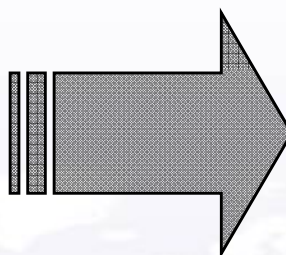
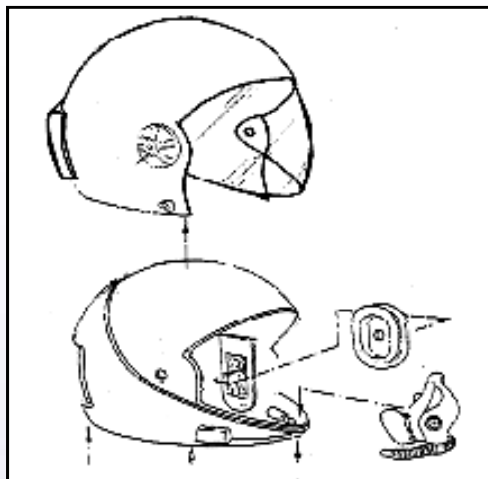
# Integration Concept

## Shell Approach



### Potential Advantages:

- Improved Protection
- Improved Filter Capacity
- Reduced Breathing Resistance
- Improved Visual Field-of-View
- Improved Comfort
- Improved Compatibility
- Improved Center-of-Gravity



- ✓ Overall Comfort and Fit
- ✓ Unblown Protection/Defog
- ✓ Faceplate Stowage

Protection w/o Helmet

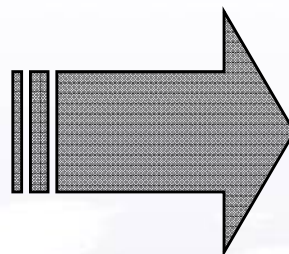
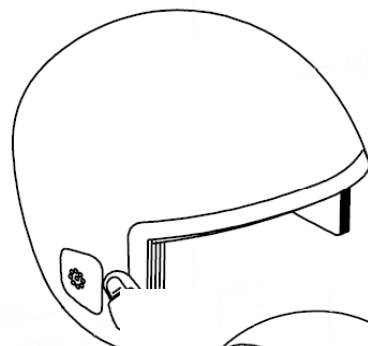
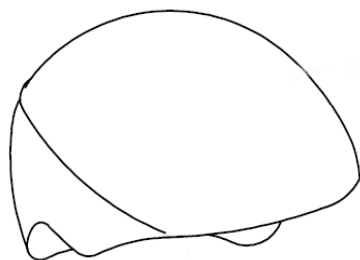
Overall Weight/Bulk





# Integration Concept

## Liner Approach



### Potential Advantages:

- Improved Protection
- Improved Filter Capacity
- Reduced Breathing Resistance
- Improved Visual Field-of-View
- Improved Comfort
- Improved Compatibility
- Improved Center-of-Gravity

✓ Overall Comfort and Fit

✓ Unblown Protection/Defog

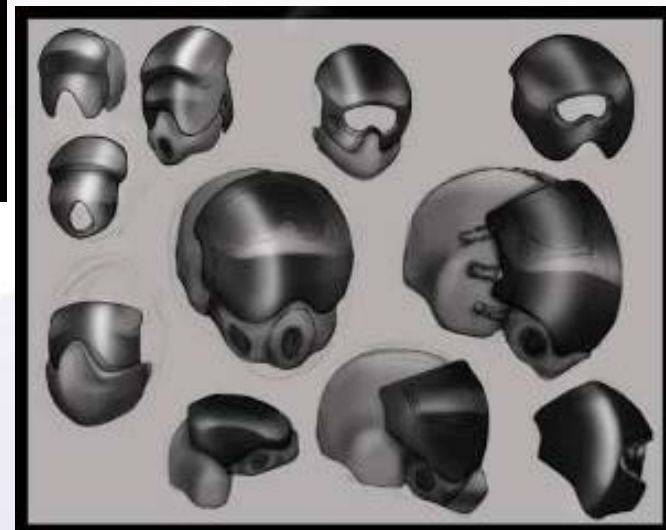
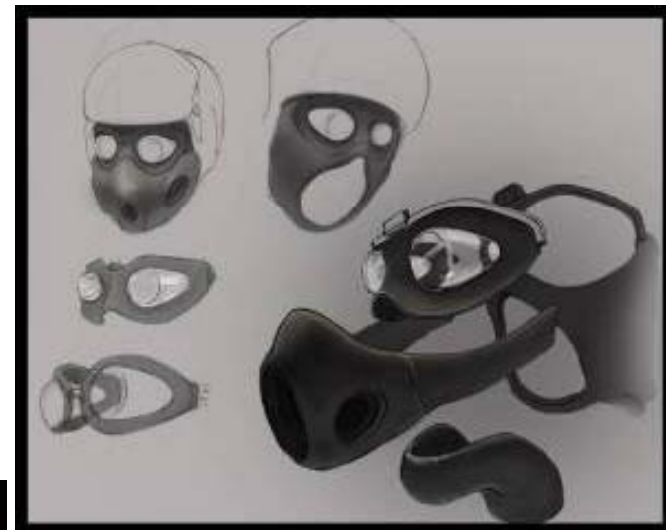
Faceplate Stowage

✓ Protection w/o Helmet

Overall Weight/Bulk



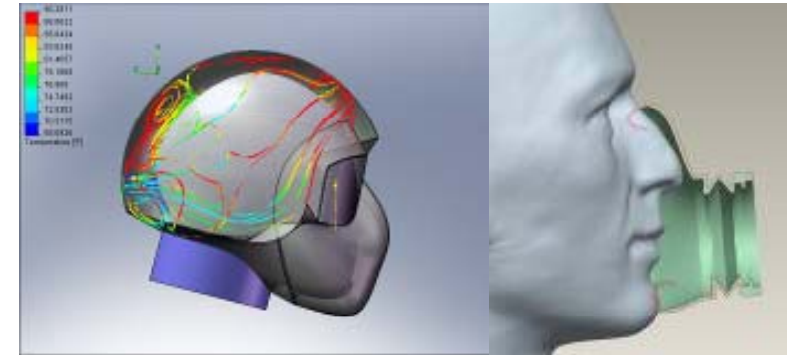
# JPM-IP Concepts



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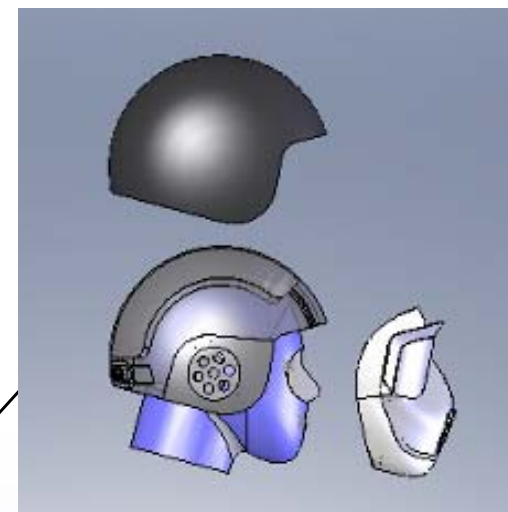
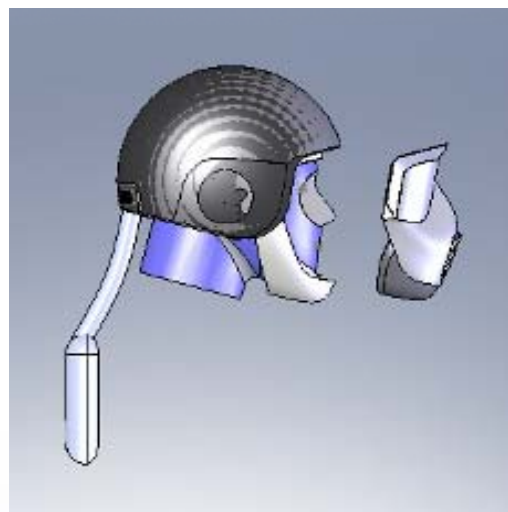
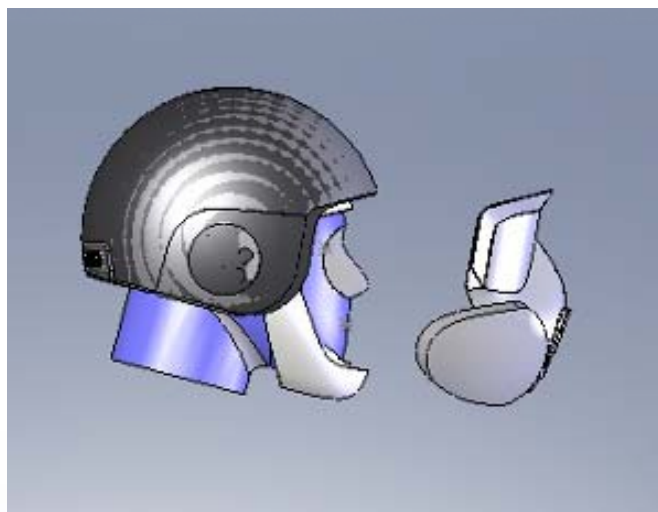
# Filter Locations



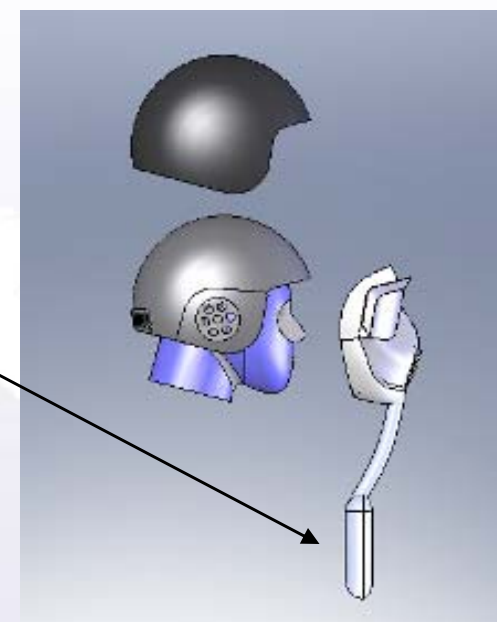
Option	Description	Comments
1	Filter located in the back part of the helmet	Air would circulate through the filter and up to the front module through a ducting system located in the helmet shell.
2	Filter located in front part of the helmet	Air would circulate through the front module in a way similar to standard masks
3	Filter part of helmet liner	In this option the filter would actually serve a dual purpose. Filtration would occur through the helmet liner and the media would crush in a fashion similar to the existing helmet liners to provide crash protection
4	Filter located on body	As with current aircrew and some CVC systems. This option would require a hose and hose connections could be placed in either the front or back helmet module
5	Filter part of hood	Air would be ducted to the front module and some type of connection would be required once the front module is mounted



# Integrated Helmet-Mask Systems



Filter Location  
Options



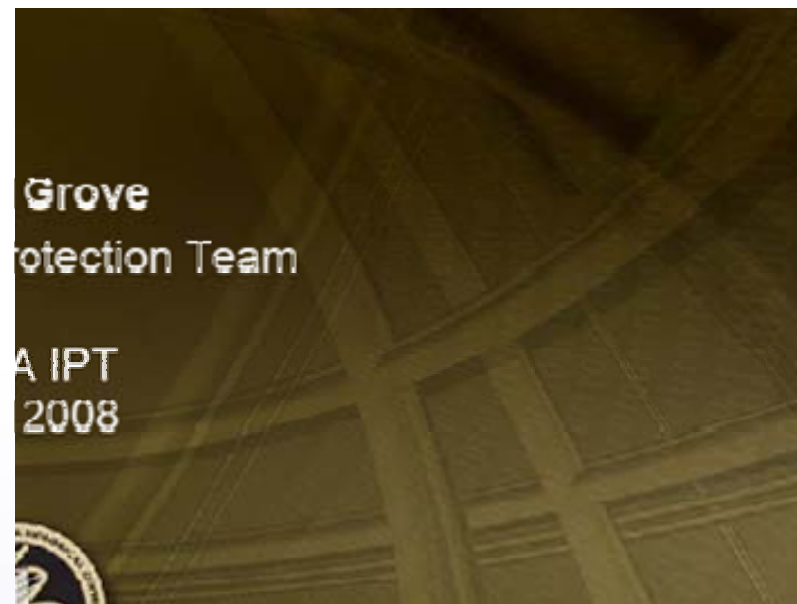
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# Integrated Helmet-Mask Systems

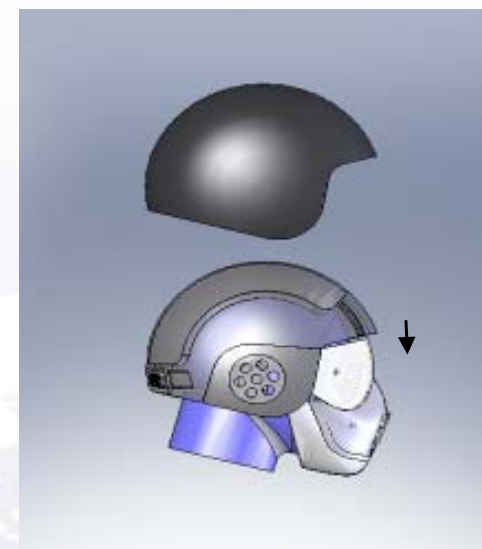
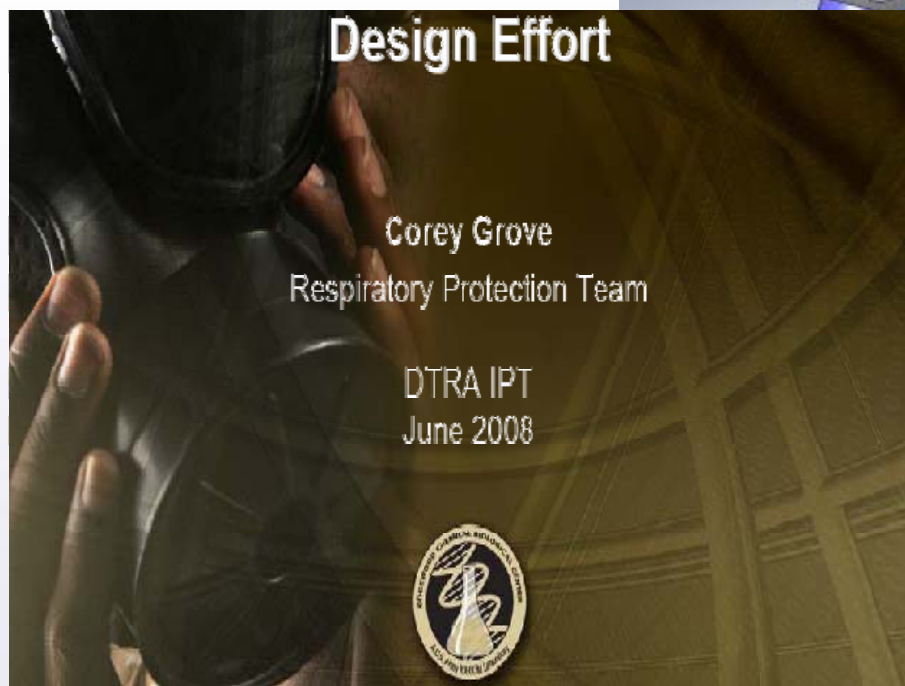
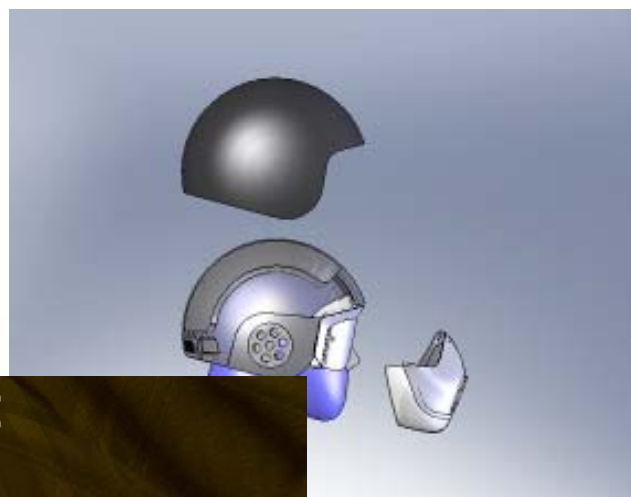
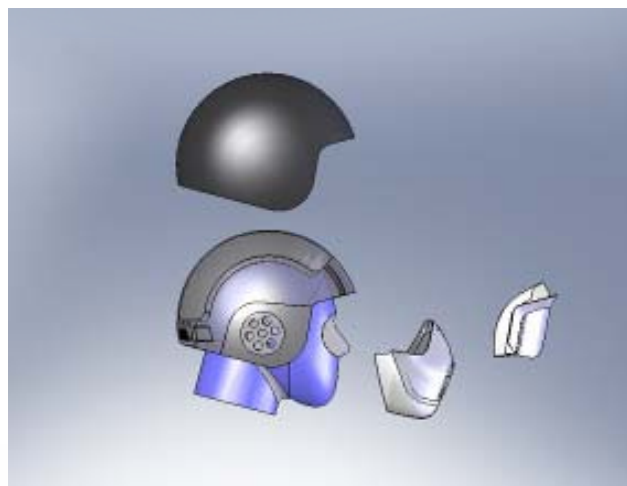
## Ratchet Options





# Integrated Helmet-Mask Systems

## Future Options



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# Ground Helmet Interfaces



USMC ECVCH



US Army ACH



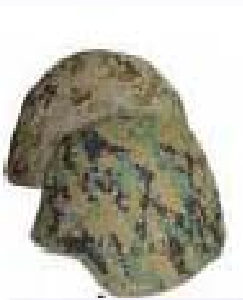
SOCOM MICH



US Army CVC



USMC HBSI



USMC LWH



USMC ECVCH



# Aviation Helmet Interfaces



HGU-68/P



HGU-55/P

HGU-56/P

IHADSS

HGU-84/P

## WARFIGHTER PROTECTION DIVISION

### Materials & Methods to the Current US Army Aviator's Helmet (HGU-56/P)

Presented to the  
Institute for Defense and Government Advancement  
Warfighter Systems Integration Symposium





# Multi-Purpose Technology

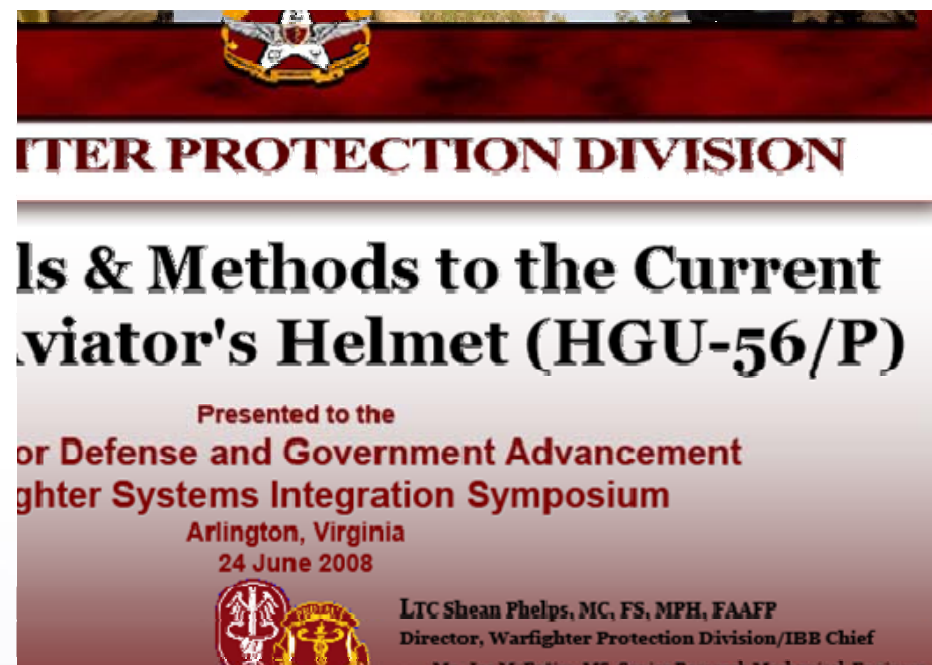
Helmet Liners and Combat Caps

Can these be used for:

Improved fit and comfort / energy  
absorption / increased  
fragmentation protection

AND

Filtration?



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# Conclusion

- **Evolving threat**
- **Traditional approaches encumber warfighters**
- **Partnering with associated programs of record is key to IP vision of integrated ensembles**
- **Key enablers:**
  - Multiple use technology
  - Family of systems, integrated approach
  - IP Tech Demo
  - Tradespace decisions based on operational risk assessment
- **Advanced technology coupled with integration imperatives**



# Questions ?






# UNCLASSIFIED

## Individual and Collective Protection Capability Gaps

July 22, 2008

A faint, light blue world map is visible in the background of the lower half of the slide, centered behind the text.

**CHRISTINE J. CRABILL**  
Shield Integrated Product Team Lead  
Joint Program Executive Office  
For Chemical and Biological Defense  
(703) 681-9600

Distribution Statement A: Approved for Public Release; Distribution is Unlimited

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# JPEO CBD Integrated Product Team SHIELD Functional Area

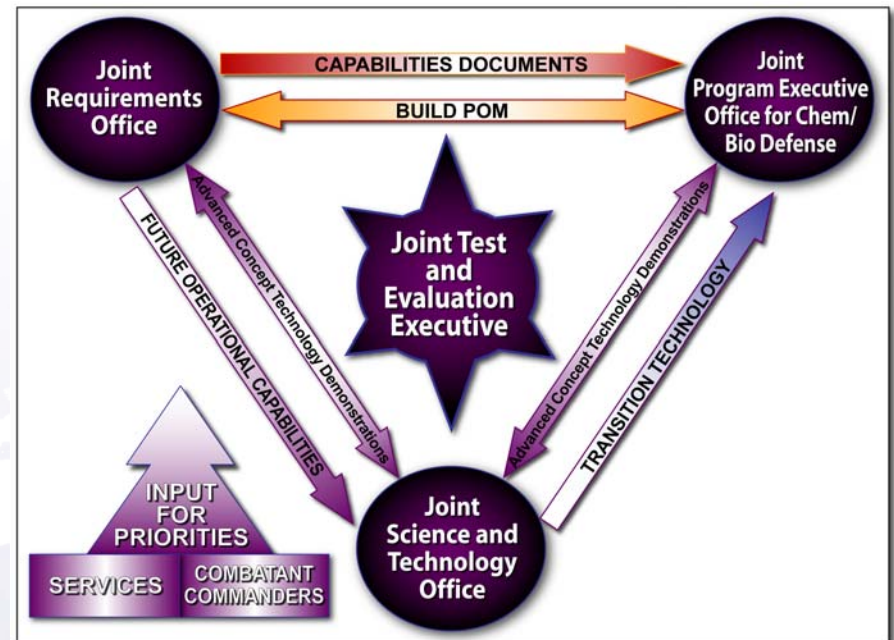


## Multidisciplinary Team

- Acquisition
- Technology
- Systems Engineering
- Test and Evaluation
- Life Cycle Management
- Resources

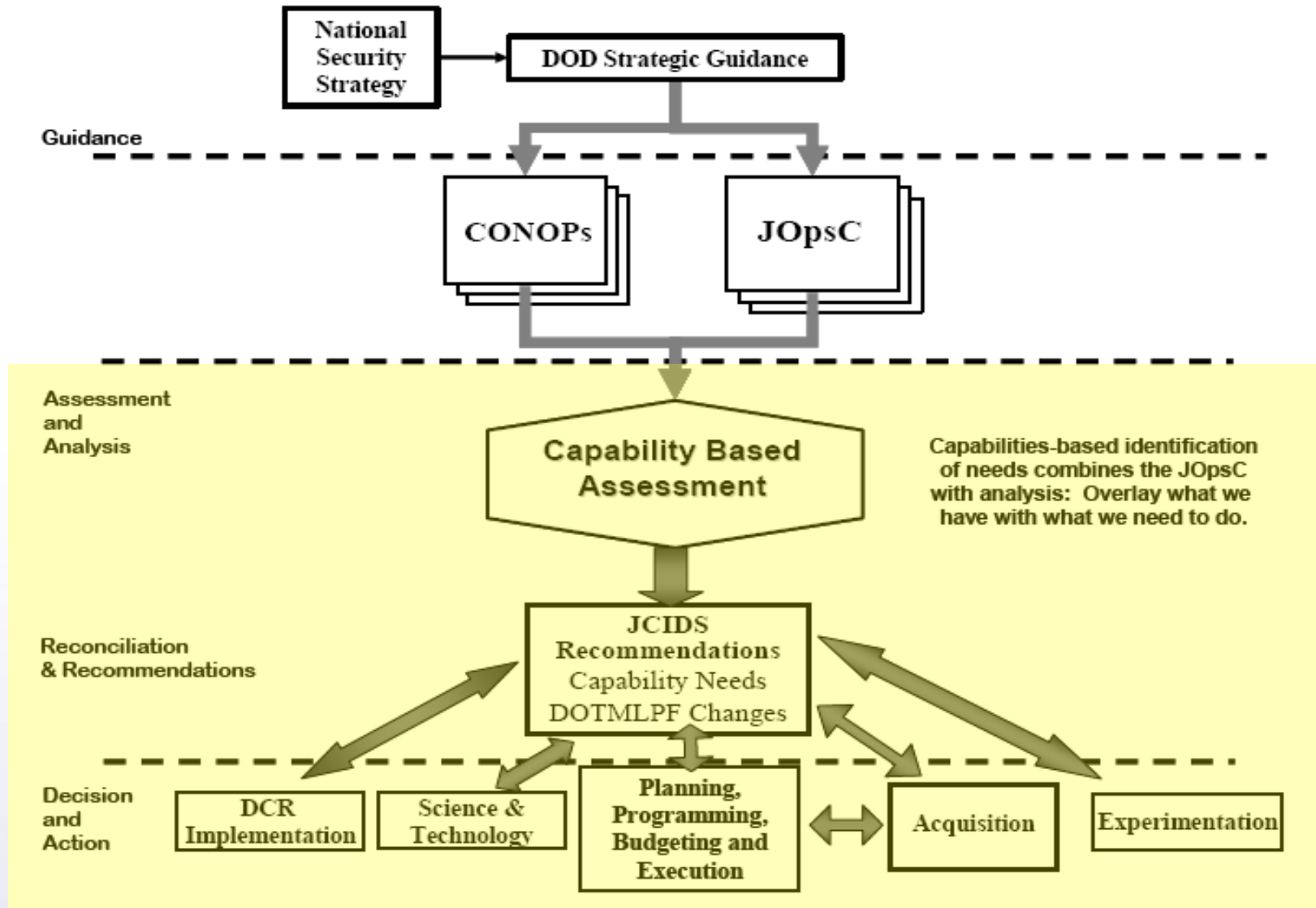
## Areas of Responsibility

- Individual Protection
- Collective Protection
- Medical Prophylaxis
- Weapons of Mass Destruction Civil Support
- Installation/Force Protection





# Top Down Capability Need Identification Process





# Topics

- **Operating Environment**
- **“All Hazards” Protection**
- **Human Factors**
- **Civil-Military Interoperability**
- **Interoperability/Integration**
- **Reduced Logistics Burden**







# Understanding the Operating Environment







# All Hazards Protection

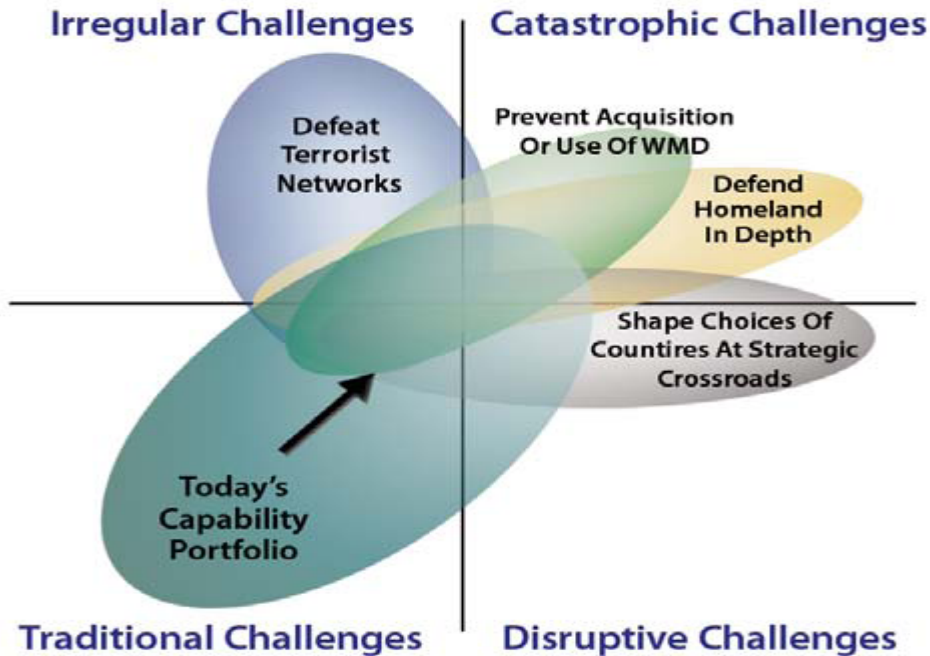


TABLE 1: Some of the TIMs on the Hazard Index List

High hazard	Medium hazard	Low hazard
Ammonia	Acetone cyanohydrin	Arsenic trichloride
Chlorine	Carbonyl sulfide	Bromine
Fluorine	Chloroacetone	Chlorine trifluoride
Formaldehyde	Ethylene dibromide	Cyanogen chloride
Hydrogen bromide	Methyl bromide	Dimethyl sulfate
Hydrogen cyanide	Methyl isocyanate	Ethyl chloroformate
Nitric acid	Phosphorus oxychloride	Iron pentacarbonyl
Phosgene	Sulfuryl chloride	Isopropyl isocyanate
Sulfur dioxide	Trifluoroacetyl chloride	Nitric oxide

Source: Reference 5.



# Individual Protective Equipment





# Civil – Military Interoperability

- **Facilitate interoperability**
- **Promote uniformity**
  - Common understanding of performance & appropriate use of shared equipment
- **Support DoD missions and others**
- **Equipment is accepted by all parties involved in response**
- **Capability is understood by Incident Commander facilitating efficient use of resources**





# CBRN Capability for Integration into Major Defense Acquisition Programs (MDAP)



**Working with 17 MDAPS to Date**

**CBRN REQUIREMENTS**

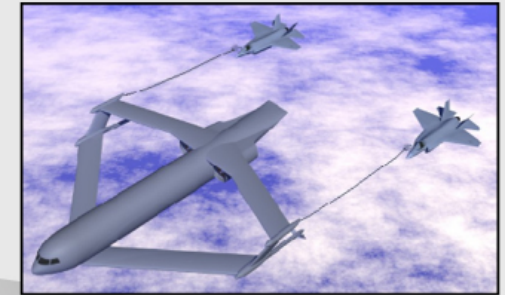
**CBR Detection  
Battle Management  
Integrated Early Warning  
Collective Protection**

**Decontamination  
Individual Protection**

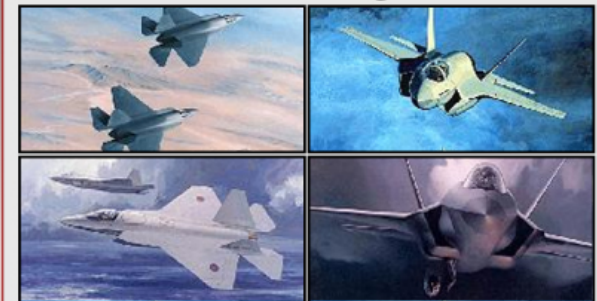
**Expeditionary Fighting Vehicle**



**KC-X**

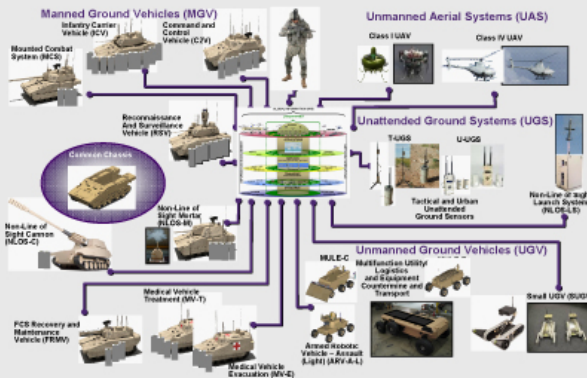


**Joint Strike Fighter**



**OTHERS  
JMAC, JLTV, MRAP**

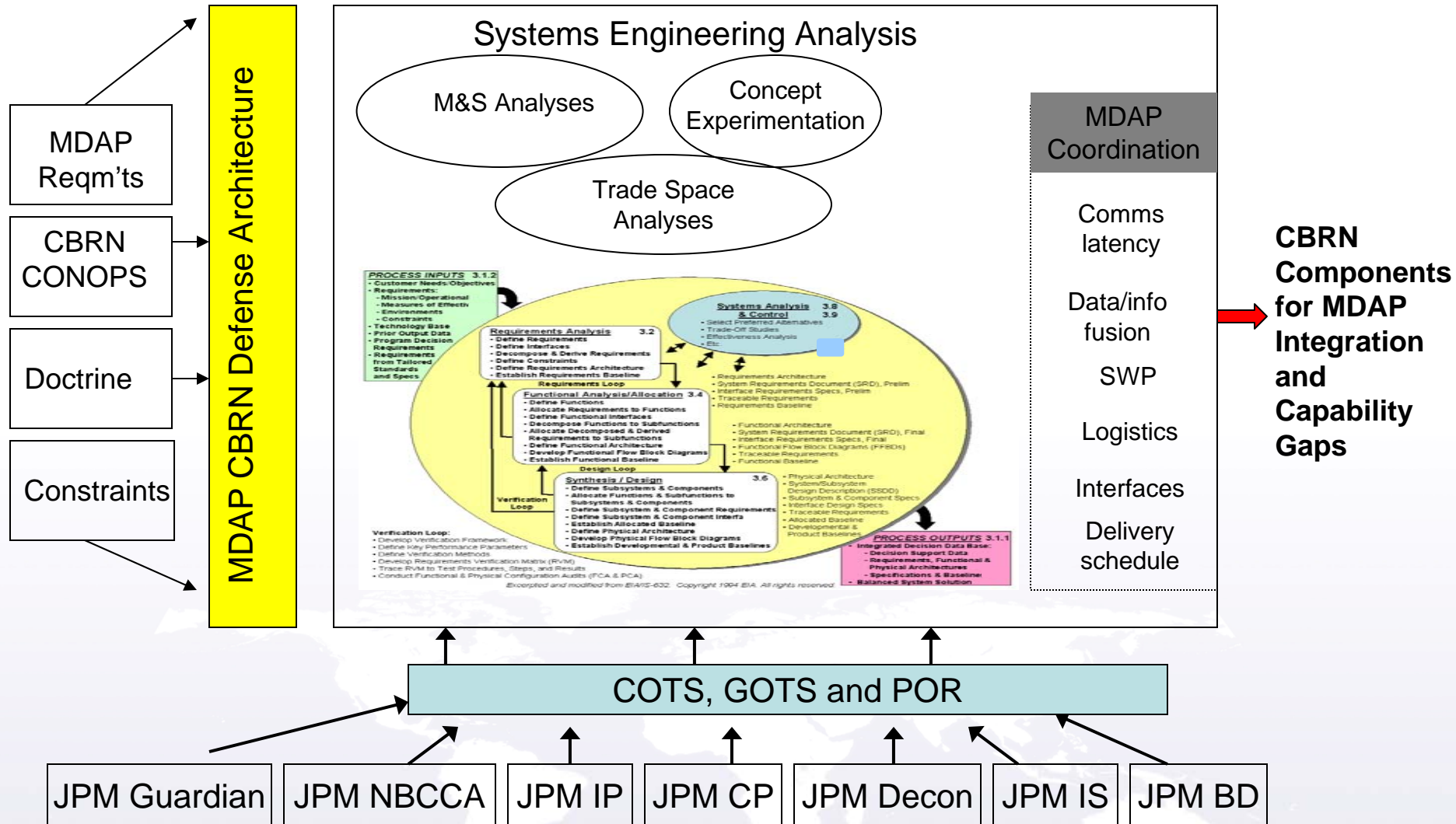
## FUTURE COMBAT SYSTEMS







# MDAP Specific Coordination





# Summary

- **All hazard filtration**
  - Toxic Industrial Chemicals
  - Emerging Threats
- **Human factors**
  - Breathing resistance
  - Size
  - Weight
- **Interoperability**
  - Size, weight, power of collective protection capability
- **Reduction in cost and logistics burden**
  - Reduce frequency of filter replacement
  - Filter life indication
  - Interface standardization

# ***Joint Science and Technology Office (JSTO) Filtration Initiatives***

***Joint Project Manager for Individual  
Protection and Collective Protection  
Industry Day***

***July 22, 2008***



**DISTRIBUTION STATEMENT A.** Approved for public release; distribution is unlimited.



# Agenda

- Joint Science and Technology Overview
- General Technology Development Approach
- Air Purification Technologies
  - Sorptive Media
  - Particulate Removal Media
  - Oxidative
  - Regenerative
  - Hybrid and other Media-less approaches
  - Residual Life Indication
- Funding Summary





# CB Defense Program

*JOINT REQUIREMENTS OFFICE*

*OFFICE OF THE SECRETARY OF DEFENSE*

*JOINT PROGRAM  
EXECUTIVE OFFICE*

*JOINT SCIENCE AND  
TECHNOLOGY OFFICE*

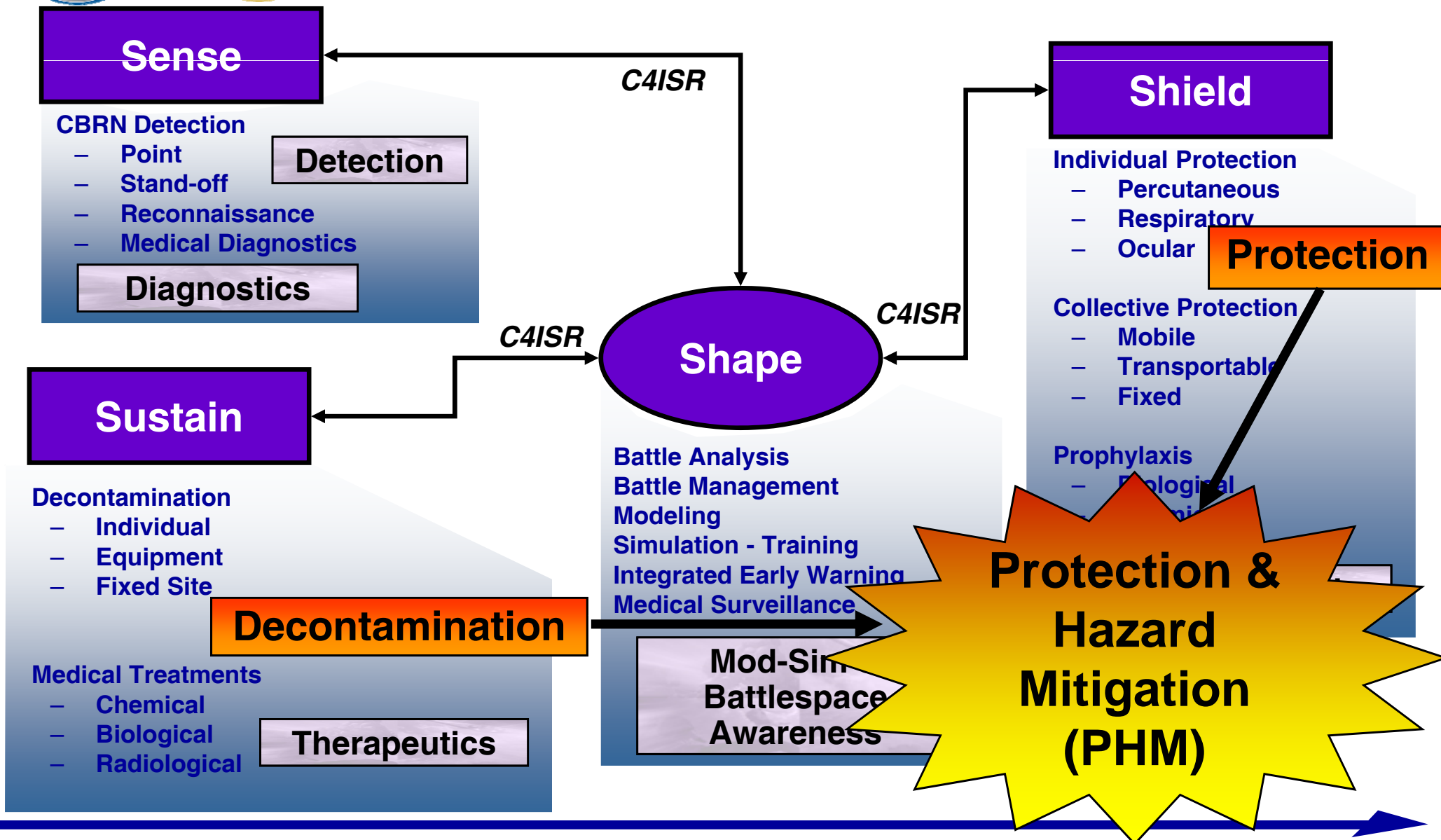
*JOINT TEST AND  
EVALUATION EXECUTIVE*

*JOINT COMBAT  
DEVELOPER*

*Delivering Joint Warfighting Capabilities*



# CBRN Doctrinal Elements



Unclassified



# The Low-Burden Imperative

Like Improvised Explosive Devices (IEDs), future threat use of CB weapons will likely be immediate, intense, and local. Thus, to have its greatest impact, protective and hazard mitigation measures must be constantly available. This necessitates low-burden equipment.



## Sources of Burden:

- Physiological
- Cognitive
- Logistical
- Operational



# Technology Development Process

**Basic Rsch**



Technical Readiness Levels (TRL)

**Applied Research**

**Adv Tech Dev**

**Integrate/ SD&D**

**Proc**

**Program Milestones**



**FRP**

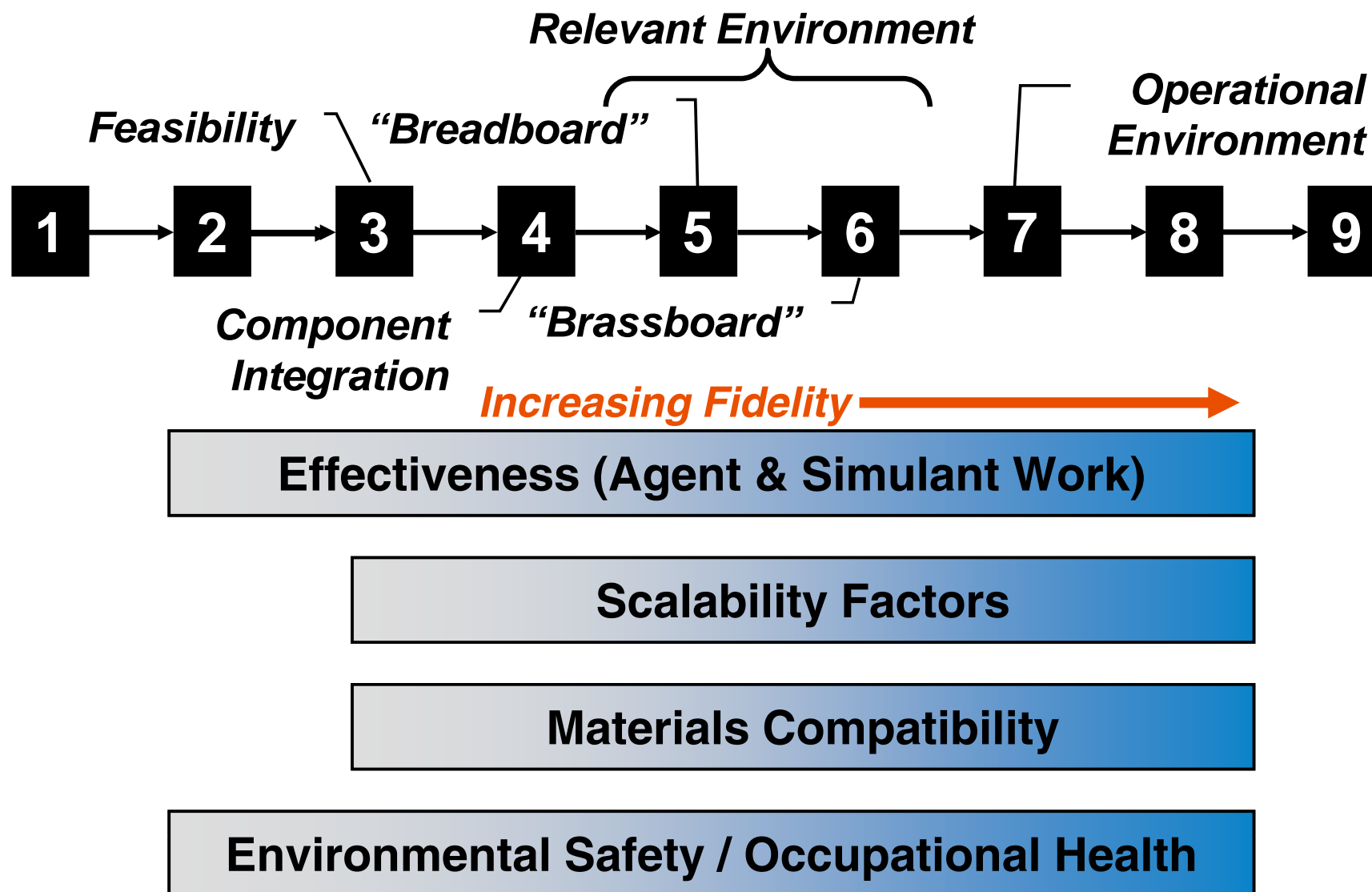
***Increasing Fidelity wrt Operational Environment***

Unclassified





# Technology Development Process





# Additional “ilities”

- Maintainability
- Supportability
- Transportability
- Sustainability
- Packaging, Handling, and Storage
- Additional equipment required to support system
- Affordability
- Training and Training Support (e.g. training aids, training systems, etc.)
- Technical Data
- Survivability
- Reliability
- Human Factors
- Facilities
- Producibility



# Technology Readiness Assessments

- Informal internal assessments to confirm TRLs 3 & 4, and a formal and/or independent assessment to confirm TRL 6 at Milestone “B” for transition to an acquisition program
- Expect TRL maturity “step” to provide ‘proof’ of completion
- Data must be objective, robust, and statistically significant supporting the performance of a technology for its intended application
- Correlation of data to the intended operational environment is critical

# ***Air Purification Technologies***



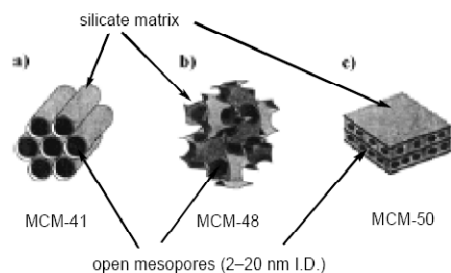
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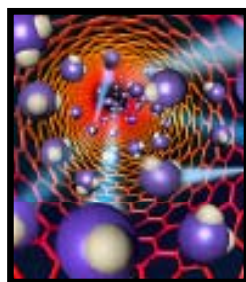


# Sorbative Media

- **Performance Objectives**
  - Increased TIC Capacity
  - Lower resistance
  - Smaller size volume/lower profile
- **Technical Objectives**
  - Increase retention of high volatility substances by increasing affinity/reactivity
  - Increase capacity of media

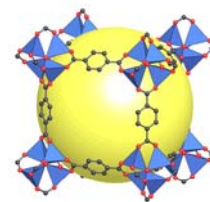


**Meso-Porous Structures**

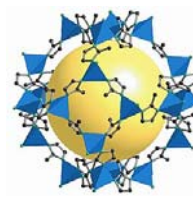


**CNTs/CNFs**

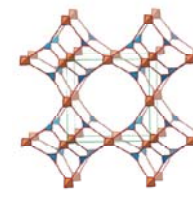
## *Reticular Chemistry*



**MOFs**



**ZIFs**



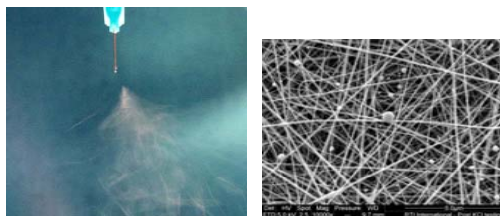
**COFs**

- **Output**
  - Well characterized novel sorptive materials
  - Validated novel bed designs
  - Design equations/parameters
- **Focus**
  - Near – TIC optimized M98 size filter
  - Mid – Low-profile/Low-burden optimized IP filters for demo (FY11)
  - Far – Smart Materials

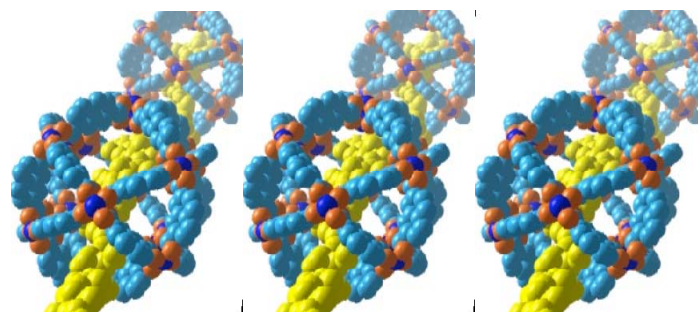


# Particulate Removal Media

- **Performance Objectives**
  - Lower resistance
  - Lower profile
- **Technical Objectives**
  - Significantly increase Figure of Merit (FoM)
  - Increase robustness of new media to meet durability and loading requirements



**Nano-Fibers**



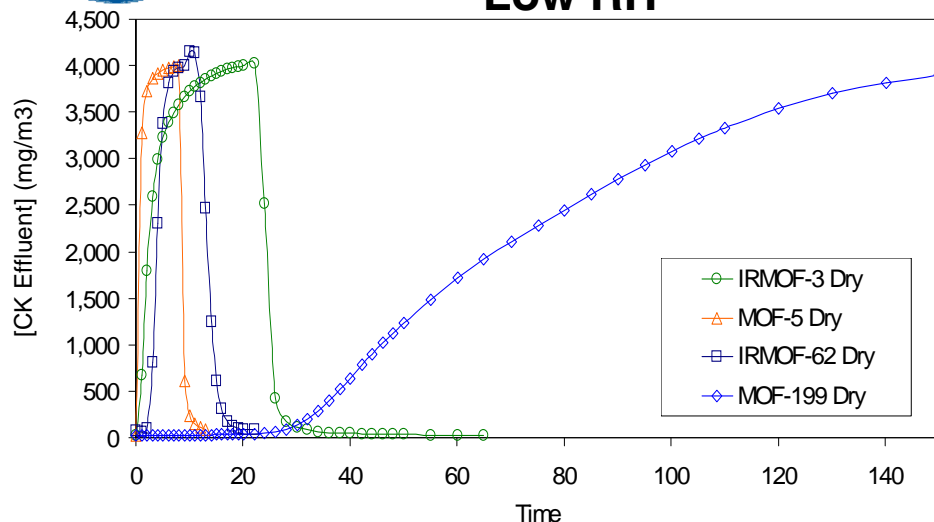
**Sorbent Integrated Nano-Fibers**

- **Output**
  - Well characterized novel materials
  - Validated designs
  - Design equations/parameters
- **Focus**
  - Near – Irregular cross-section fibers
  - Mid – Nano-fiber HEPA Media (FY11)
  - Far – Functionalized nano-fibers

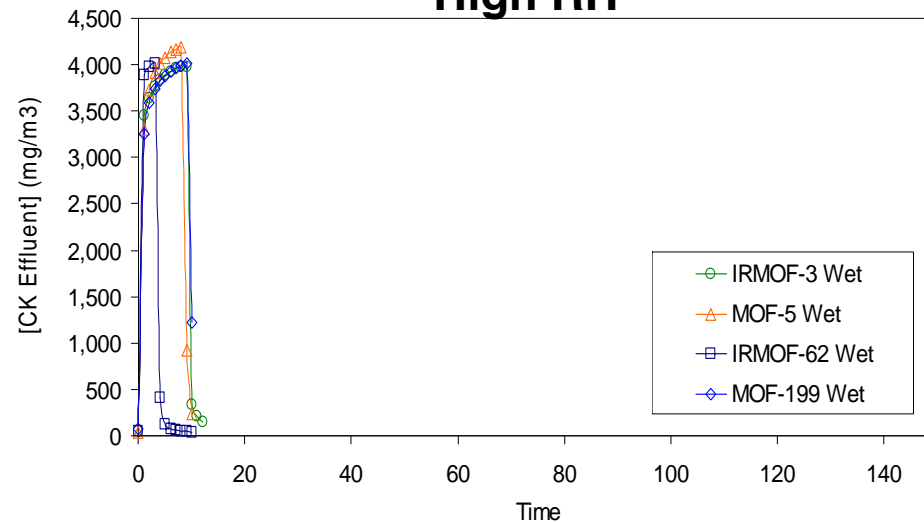


# Challenges

Low RH



High RH



Example: CK Break-Through of Material Samples

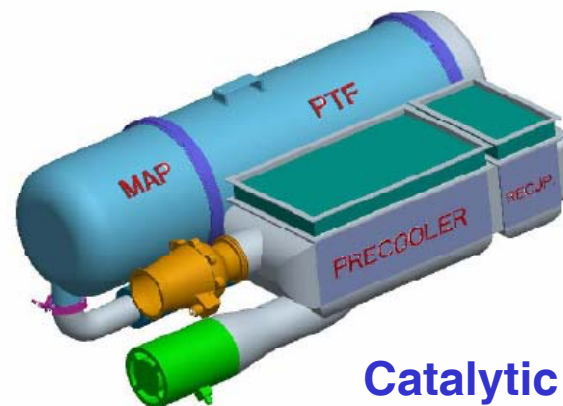
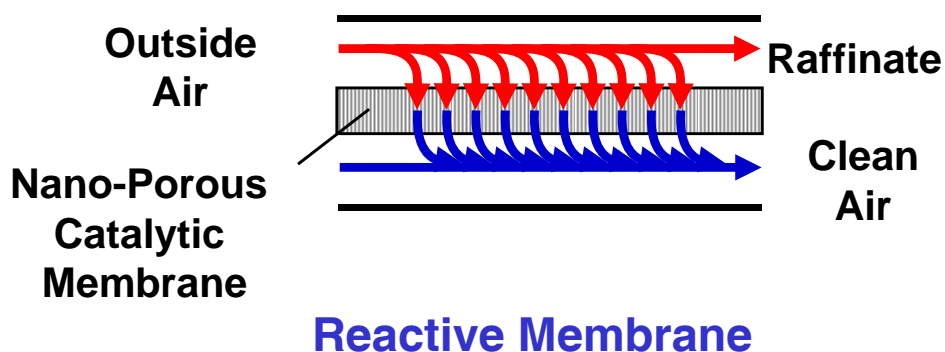
***Performance Varies With Conditions!***

- Specific Issues and Challenges:
  - How can these materials be improved to meet performance requirements over the range of environmental conditions and optimized against targeted TICs?
  - How to design robust nano-materials that perform in the intended environment?
  - How to design around potential health effects of nano-materials?
  - How are these new materials scaled to commercialization?



# Oxidative Filtration

- **Performance Objectives**
  - Size, weight and power reduction
  - Broad Threat Spectrum
  - Reduce O&M costs
- **Technical Objectives**
  - Decrease required rxn temperature
  - Increase robustness of catalyst
  - Reduce size of post treatment



**Catalytic Oxidation**

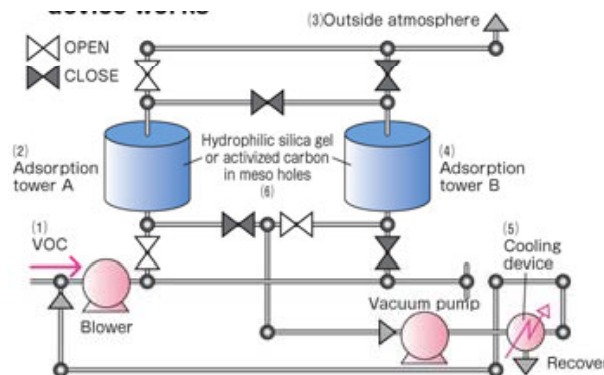
- **Output**
  - Validated prototypes
  - Design equations and parameters
- **Focus**
  - Near – CATOX demonstrator (FY09 – FY11)
  - Mid/Far – Low-temperature combustion / Membrane reactor





# Regenerative Filtration

- **Performance Objectives**
  - Size, weight and power reduction
  - Broad Threat Spectrum
  - Smaller size volume/lower profile
- **Technical Objectives**
  - Improved broad spectrum media
  - Better engineered heat transfer
  - Design simplicity



**Swing Adsorption**

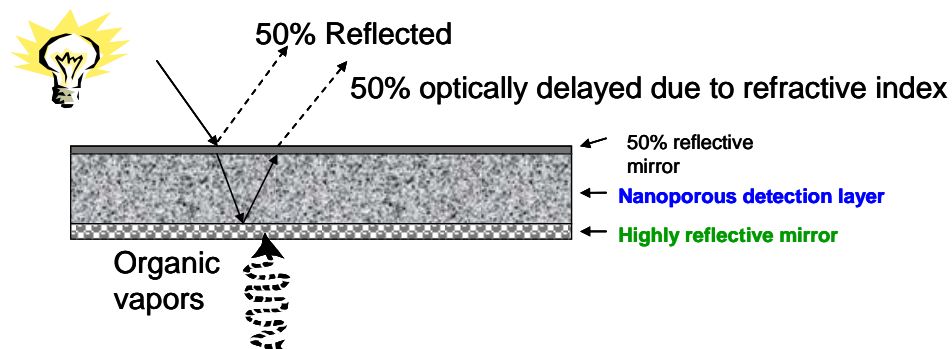
- **Output**
  - Validated prototypes
  - Design equations and parameters
- **Focus**
  - Near – Hunter Manufacturing demonstration
  - Mid/Far – Tech watch for novel and effective approaches





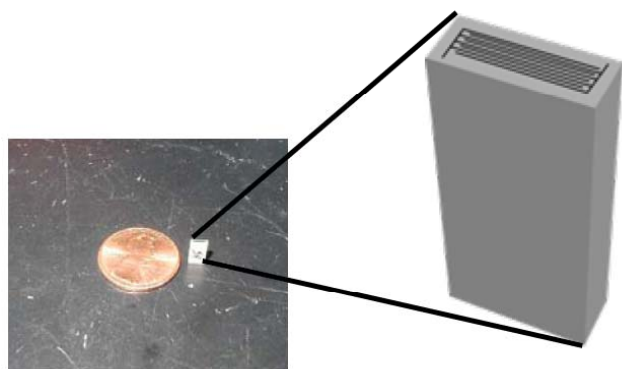
# Residual Life Indicator (RLI)

- **Performance Objectives**
  - Indicate remaining service life (normal O&M)
  - Warn user of impending failure
- **Technical Objective**
  - Broad range indicators
  - Direct interrogation of the media



## Refractive Capacity Indicator

- **Output**
  - Agent indicators
  - Validated broad-spectrum process
- **Focus**
  - Near (transitioned) – Colorimetric acid gas indicators
  - Mid/Far – Direct interrogation sensor technologies



## Elector Impedance Spectroscopy

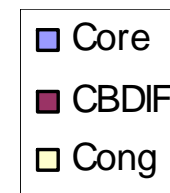
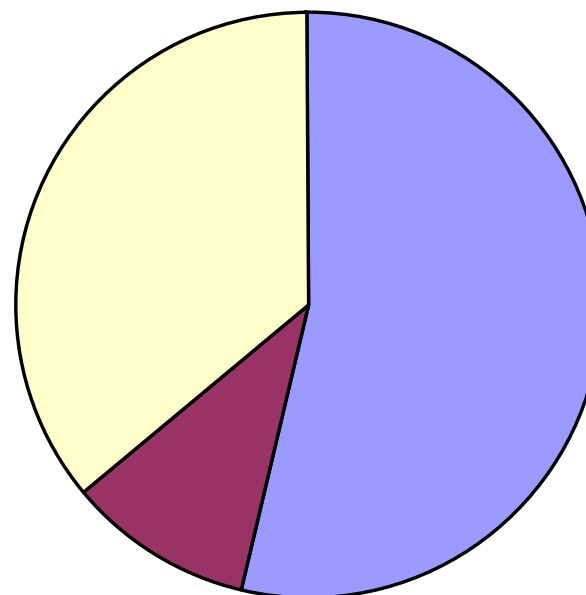
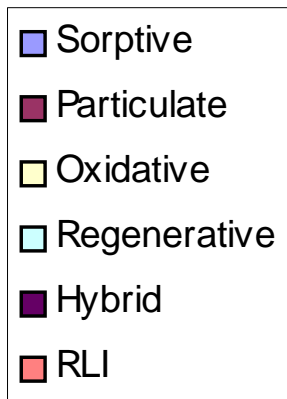
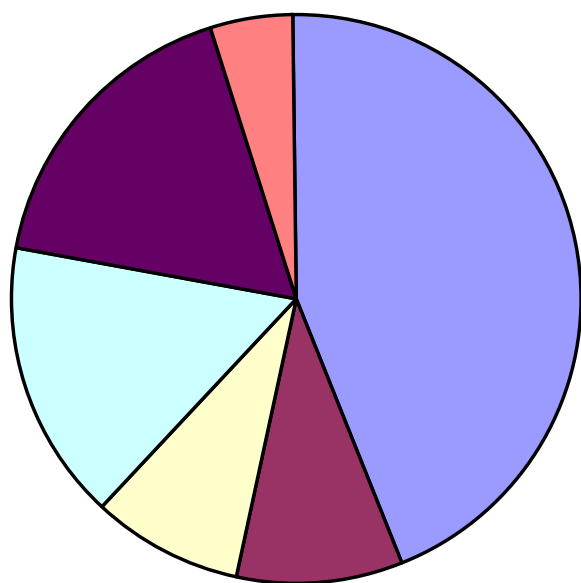


# RLI: Interrogate vs. Detection

Seeking methods that directly interrogate the residual capacity of the filter bed. Additional work on detectors for specific chemicals (e.g. colorimetric strips) is not desired.



# Current Filtration Investments



Unclassified





# PHM Core S&T Funding (\$M)

YEAR/ RTDE	FY08	FY09	FY10	FY11	FY12	FY13	TOTAL FY08-13
BA2	24.3	28.2	29.0	27.8	24.7	22.6	<u>156.6</u>
BA3	5.0	5.0	3.3	2.9	2.9	2.9	<u>22.0</u>
TOTAL BUDGET	<u>29.3</u>	<u>33.2</u>	<u>32.3</u>	<u>30.7</u>	<u>27.6</u>	<u>25.5</u>	<u>178.6</u>

**Total PHM S&T Funds includes Individual and Collective Protection, and Hazard Mitigation**



# Questions?



Unclassified



UNCLASSIFIED

# ***Test Standard Development for Protection Technologies***

## **Joint Project Manager for Individual Protection and Collective Protection Industry Day**

Amy Maxwell  
Principle Investigator for CA06PRO411  
[Amy.maxwell@us.army.mil](mailto:Amy.maxwell@us.army.mil)



# Agenda

- Objective
- Overview
- Approach
- Single Pass Filtration
- CATOX
- REGEN
- Particulate Removal/Biological Neutralization
- TICs/Battlefield Contaminants
- Full-Scale ColPro Chamber Testing
- Full-Scale ColPro Field Testing
- Novel Closures
- Summary

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# Objective

- **Develop Standardized Test Methods for Collective Protection Testing of Existing and New Technologies.**
  - Testing of devices/materials against various threats to assess the protection capability of that device/material



# Overview – Test Methodologies

- **Air Purification**

- Single Pass – Sorbent, Filter (Complete)
- CATOX - Catalyst, PTF, CATOX System (FY08)
- REGEN - Sorbent, REGEN System (FY10)
- Biological Neutralization - Media, Filter (Complete)
- Particulate Removal -Media, Filter (Complete)
- BFC/TIC Down Selection Processes (FY08)
- BFC/Chemical Vapor Test Methodology (FY09-FY10)

- **Novel Closures**

- Hydrostatic Test (FY08)
- Tensile Test (FY08)
- Peel Strength (FY08)
- Chemical Resistance (FY09-FY10)
- Liner Section Frame Design (FY08)
- Closure Function Frame Design (FY08)

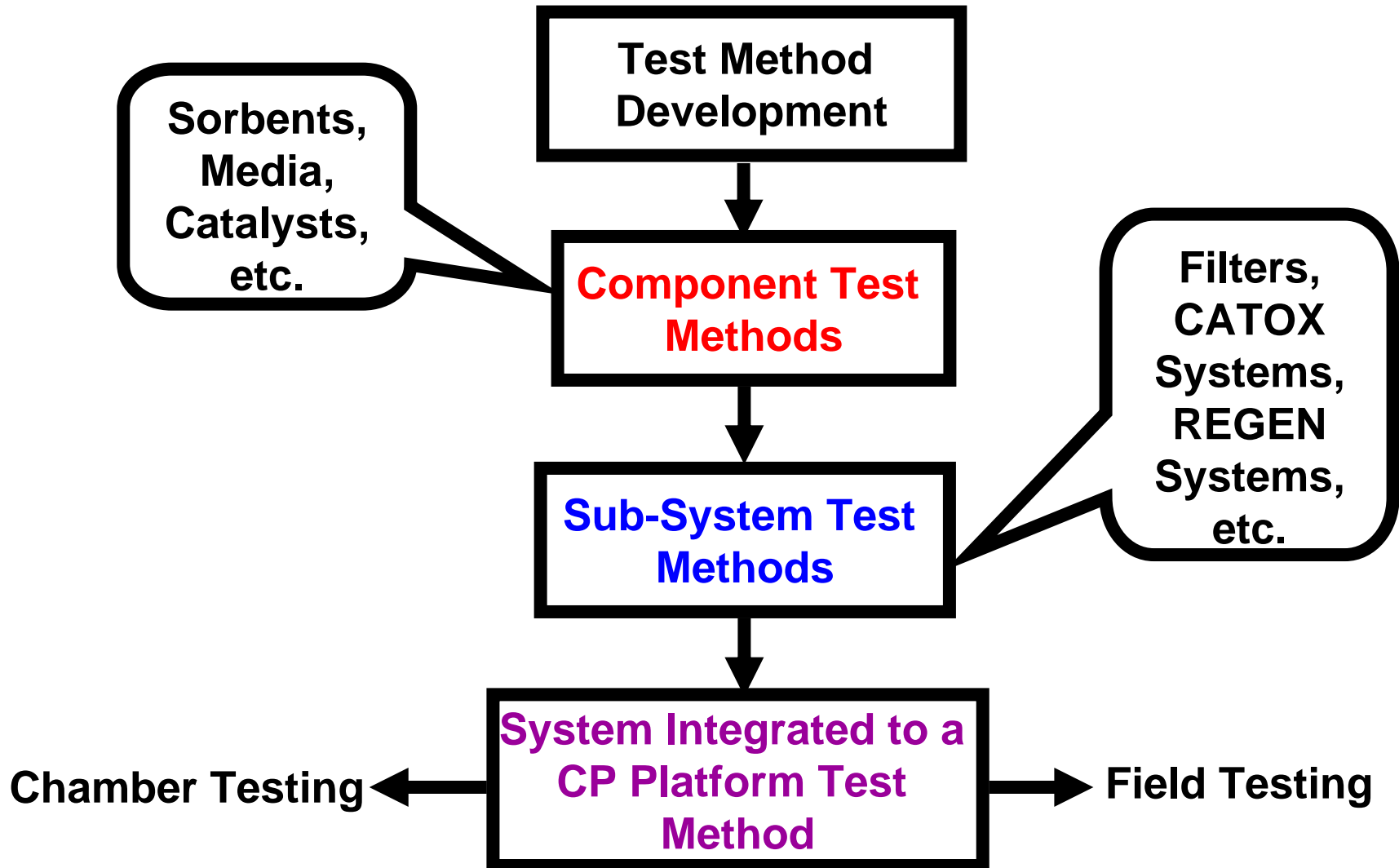
Extension to IP: Single Pass sorbent methodology applicable to IP and adaptable to single pass IP filter methodology (planned)



# Overview – Test Methodologies

- **Full Scale ColPro Field**
  - Static Chemical (FY08)
  - Dynamic Chemical Entry/Exit (FY08)
  - Dynamic Chemical Mobile Platform (FY08)
- **Full Scale ColPro Chamber**
  - Static Chemical (FY08)
  - Dynamic Chemical Entry/Exit (FY08)
  - Dynamic Wind Driven (FY08)
  - Static Inert Aerosol (FY09)
  - Sub Tests (Pressurization, Leakage, and Purge) (FY08)

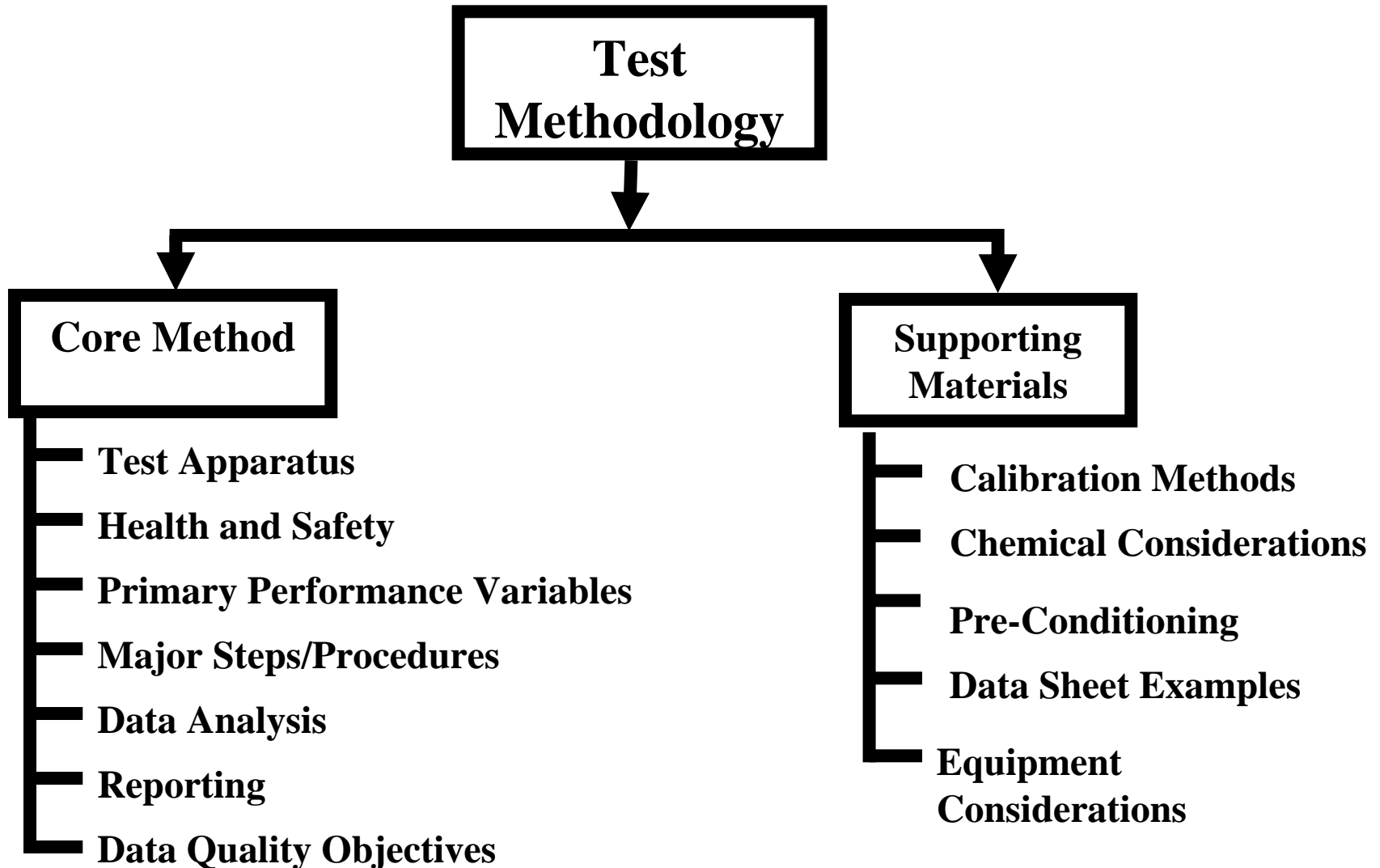
# Approach



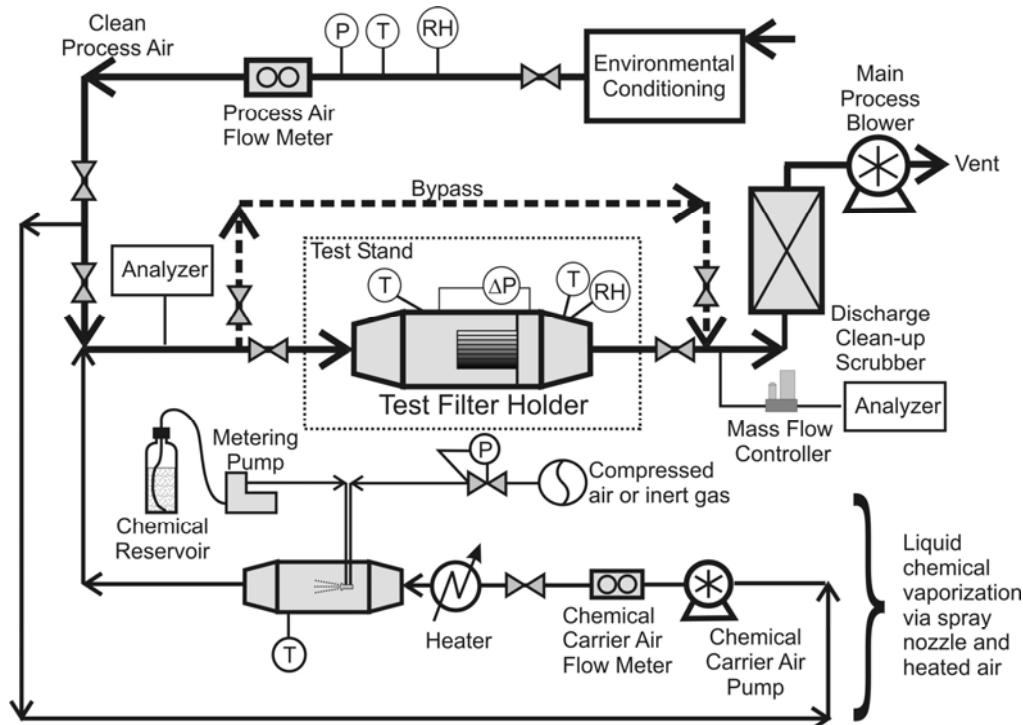
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# Approach



# Single Pass Filtration

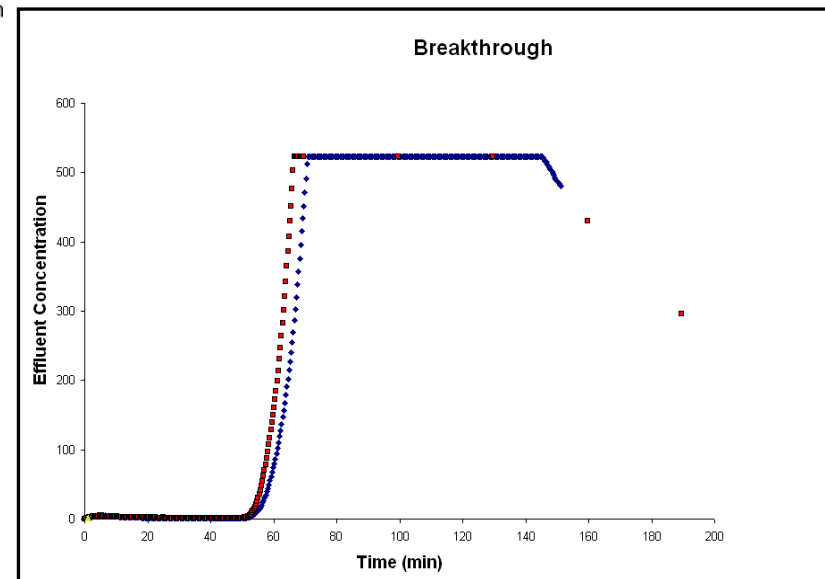


Similar Setup for IP Filter Evaluation (Proposed Activity under PRO411)

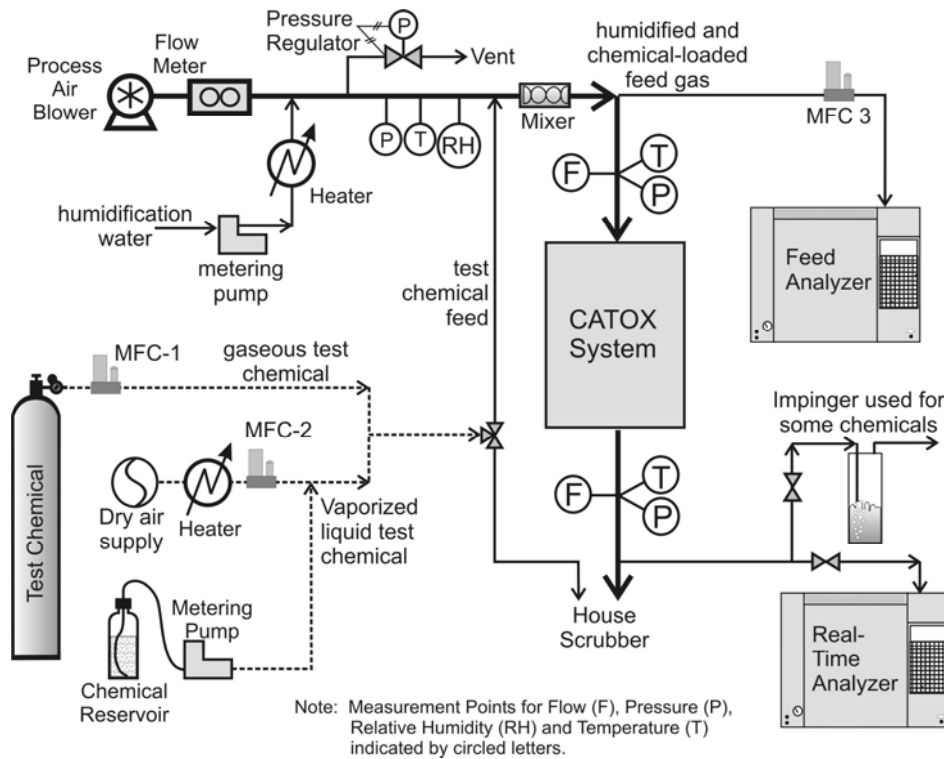
Mechanism

Removal Via Physical Adsorption or Chemical Reaction

Output



# Catalytic Oxidation



Mechanism

**Removal Via chemical reaction to destroy contaminants and threats to produce CO<sub>2</sub>, water, and haloacids**

Output

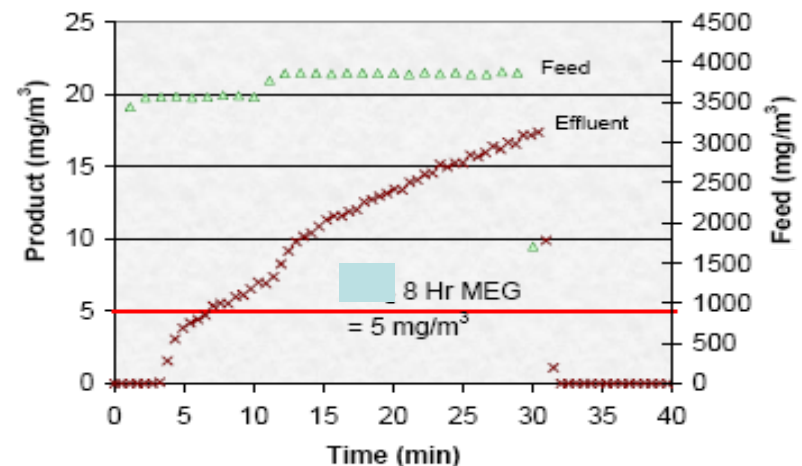
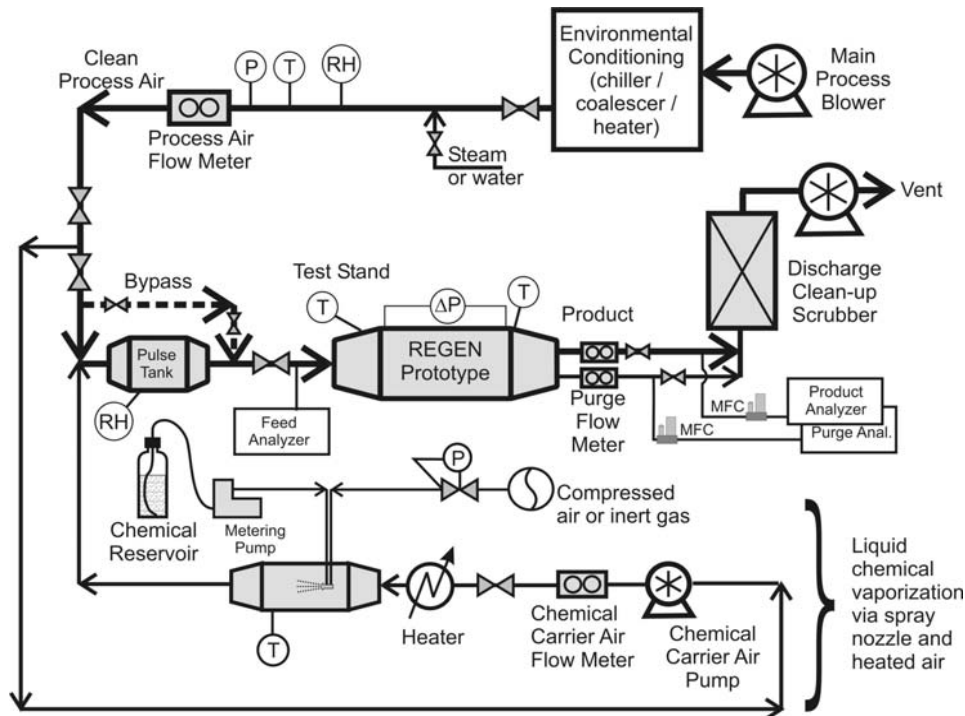


Figure 1. Scenario 2, the short, intense pulse, reveals concentrations above the 8-hr and below 1-hr MEG's

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# Regenerative Filtration



Mechanism

**Same as Single Pass, except that REGEN provides regeneration of the bed for additional physical adsorption capacity**

Output

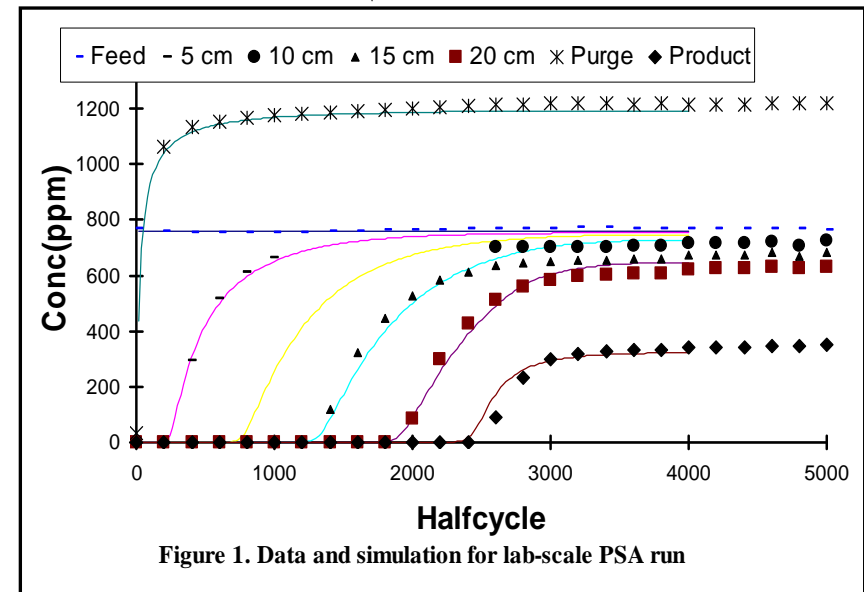
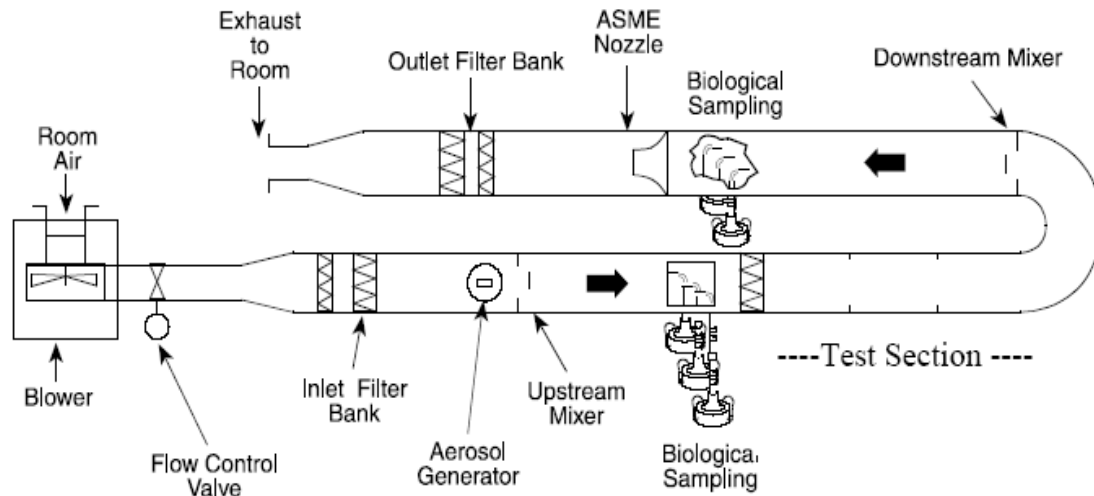


Figure 1. Data and simulation for lab-scale PSA run

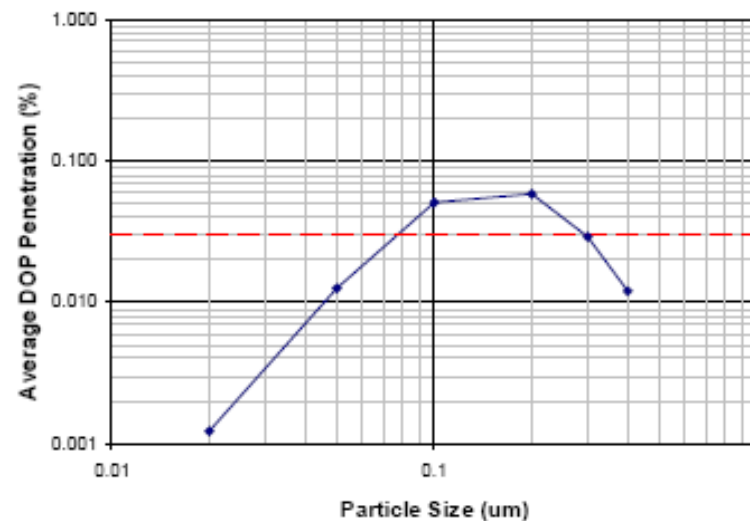
# Particulate Removal/Biological Neutralization



Mechanism

Capture and/or  
Kill/Inactivation

Output



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# TICs/Battlefield Contaminants

Full List of TICs  
or BFCs

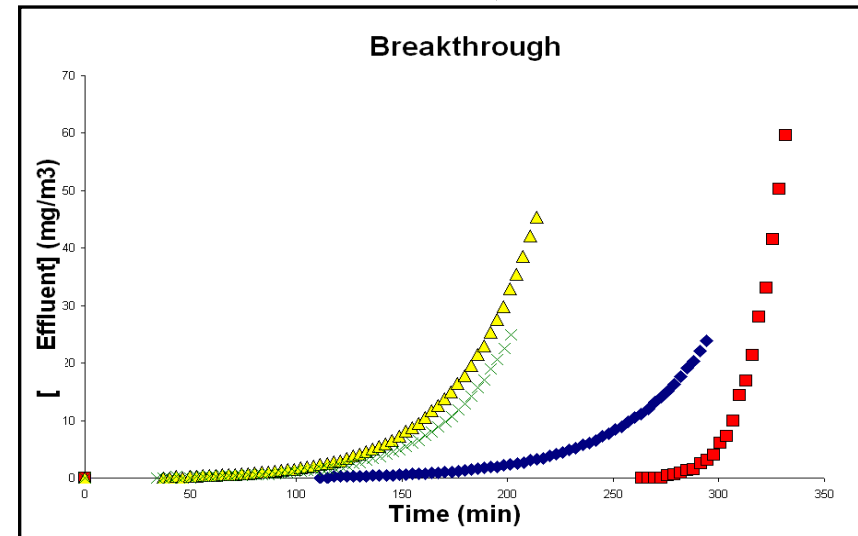
Down Selection  
Process  
(Under Development)

Shortened List of  
TICs or BFCs

Chemical Protection  
Evaluation of Air  
Purification Device

Examples of TICs:  
Ammonia  
Chlorine  
Nitrogen Dioxide  
(Fuming Nitric Acid)  
Sulfur Dioxide

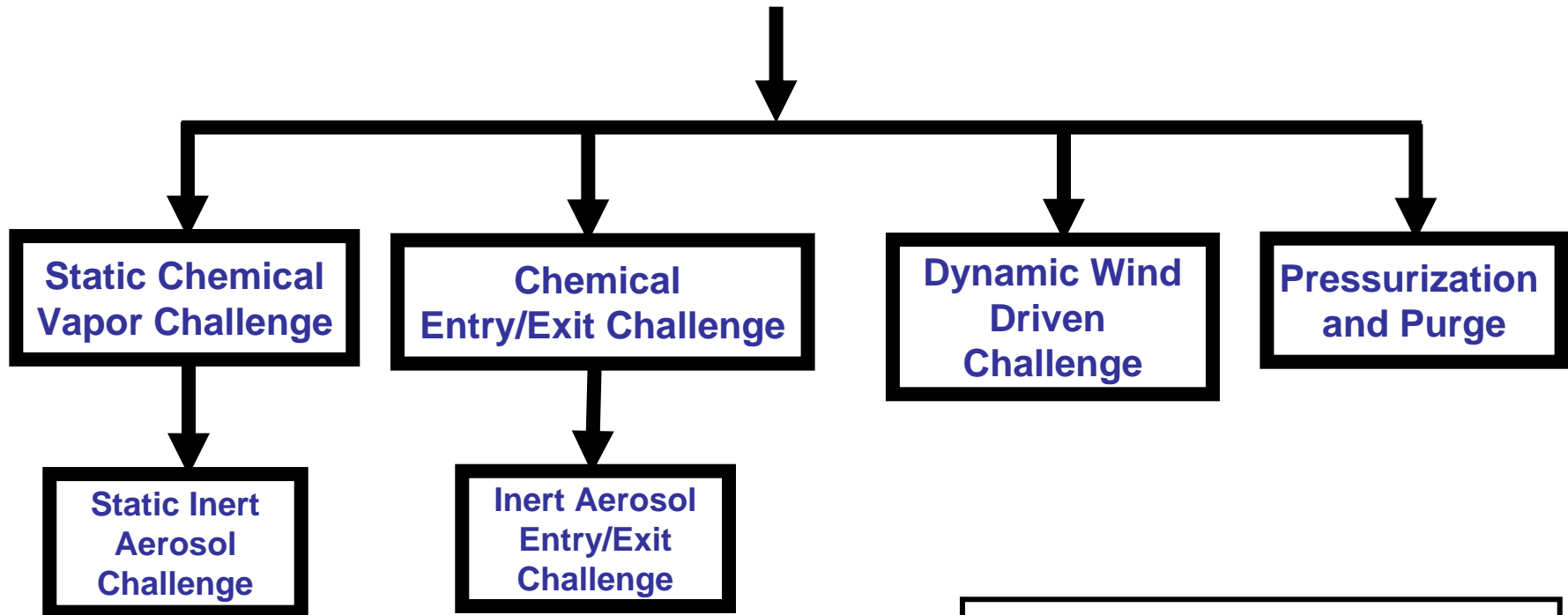
Examples of BFCs:  
Fuels  
Oils/Lubricants  
Insect Repellent  
Decon Materials



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# Overview of Full Scale ColPro Chamber Testing

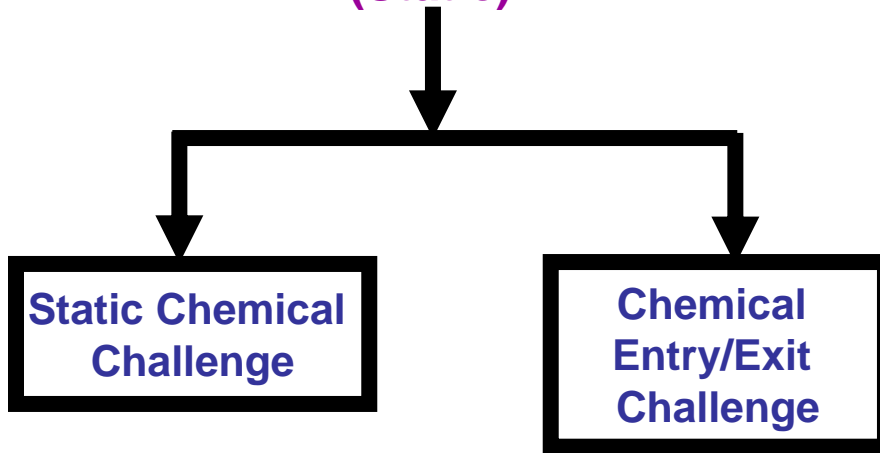
## Full Scale CP System



Methodology employs simulants to measure the protective capability of complete systems, addressing all potential mechanisms of intrusion and types of toxic agents.

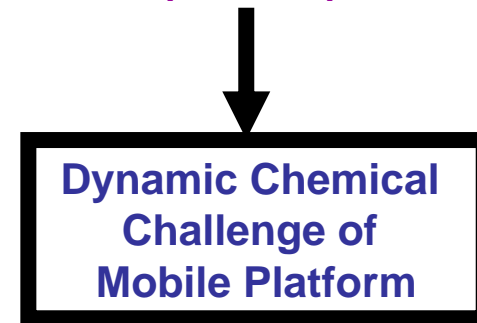
# Overview of Full Scale ColPro Field Testing

## Full Scale CP System (Static)



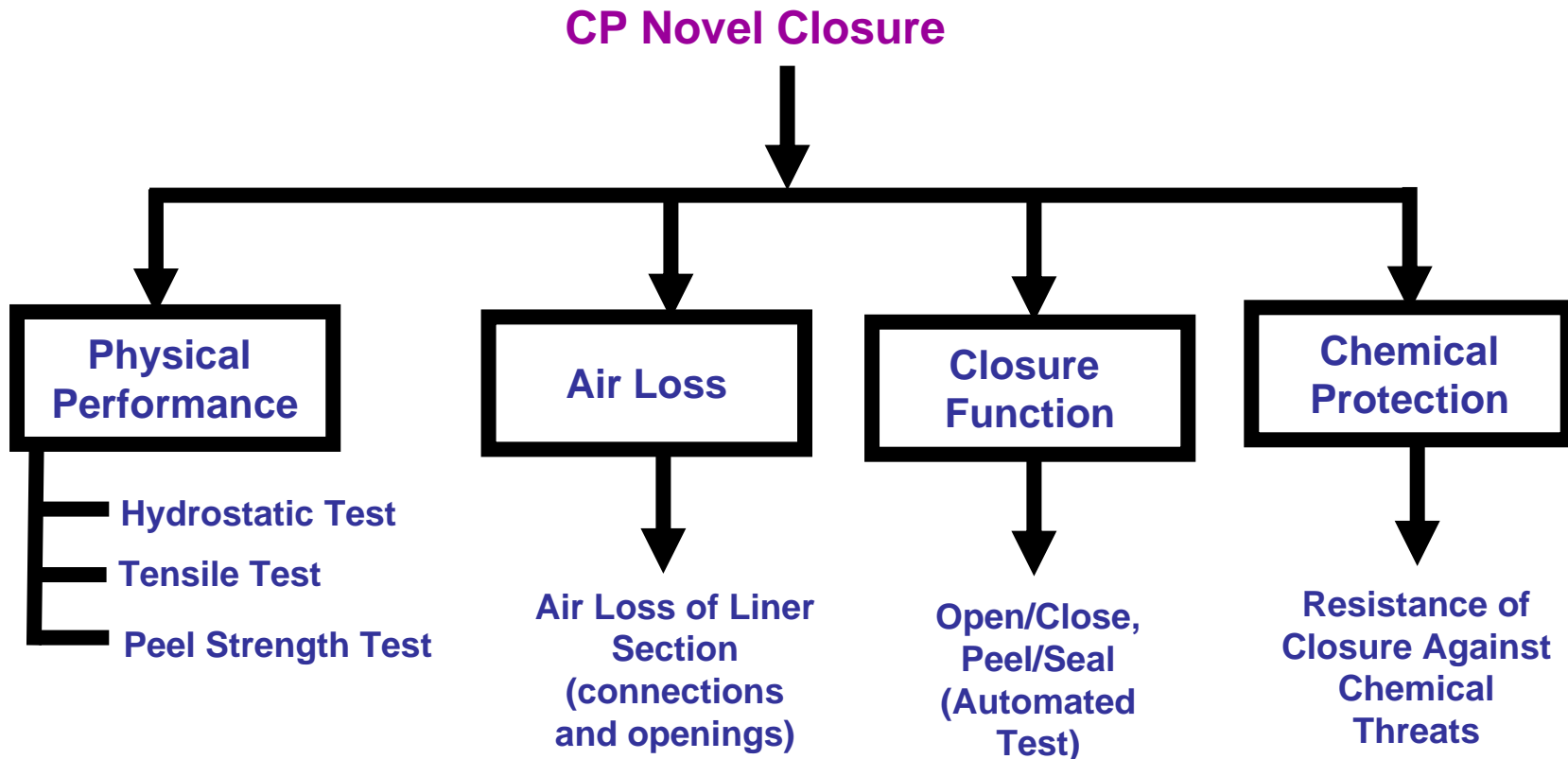
Similar to Chamber Testing, But out in the Field Environment, Less Controlled (Operational Type of Test)

## Full Scale CP System (Mobile)



Methodology measures the protective capability of a CP system in the field while its users employ the system in a simulated tactical environment (simulant only).

# Overview of Novel Closures





# Summary

- **Who can use the methodology**
  - Government
  - Contractors
  - Academia
- **Benefits**
  - Provides Standard Approach to Evaluating the Protection Provided by an Air Purification Device
  - Enables Efficient Transition and Fielding of ColPro Systems to the Warfighter
  - Allows for Comparison of Data among ColPro Systems





# ***JPM IP and the Future of Respiratory Protection: Operational and Technical Perspectives***

**Karen McGrady, Ph.D.**  
**Director, Test & Evaluation**  
**Program Lead, Future Filtration**

**Distribution Statement A. Approved for public release; distribution is unlimited.**  
**Unclassified**



# Program Overview

***The Joint Project Manager for Individual Protection (JPM-IP) is Responsible for the Development, Procurement, Fielding, and Overall Life Cycle Management of all CBRN Individual Protective Equipment Programs and Reports to the Joint Program Executive Officer for Chemical & Biological Defense (JPEO-CBD).***



# ***Future Respiratory Protection Initiative***

***Our objective is to explore leading edge technologies that have the potential to advance respiratory and ocular protection into new frontiers of capability and performance***





# ***Operational Need You Already Know: Lighten the Load***

---

- **Personal**
  - Breathing resistance
  - Temperature and sweat control
  - Psychological/Cognitive
  - Field of view, visual acuity—  
fogging and lens distortion  
reduction
  - Weight/volume
- **Logistics**
- **Cost**







# Operational Need You Already Know: Deliver Enhanced Performance

- Advanced broad spectrum capability against TIC threats
- Advanced performance under broad spectrum of conditions
  - Variable breathing rates
  - Variable temperature and humidity
  - Variable battlefield contaminant concentration
- Advanced integration— SaaS Concept
  - Platform, subsystem, system
    - Body armor
    - Helmet
    - Sighting systems
    - Cockpit, vehicle control
    - Life support systems
- Advanced system integrity assessment
  - Service Life Indicator

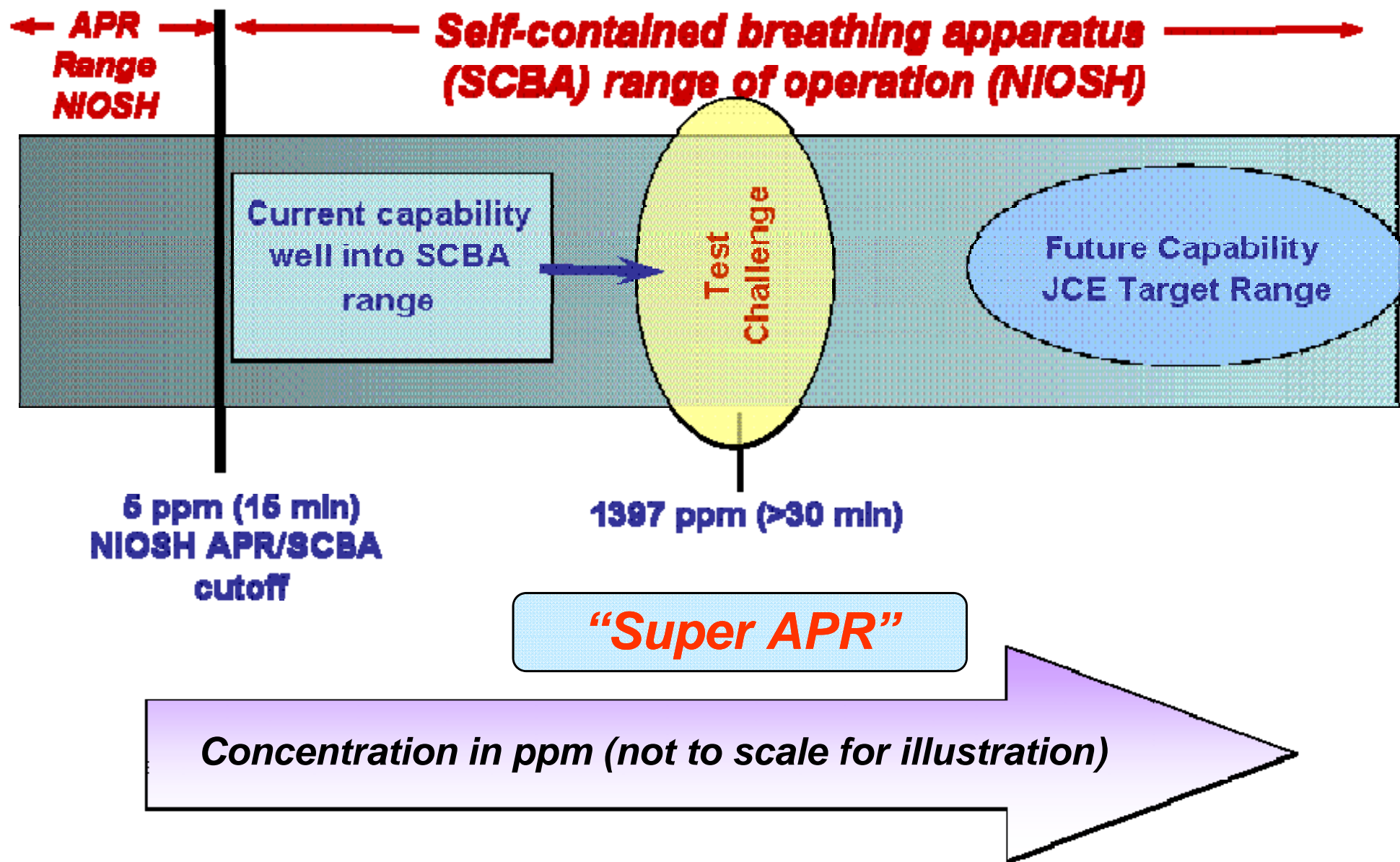
*Perform and Integrate*



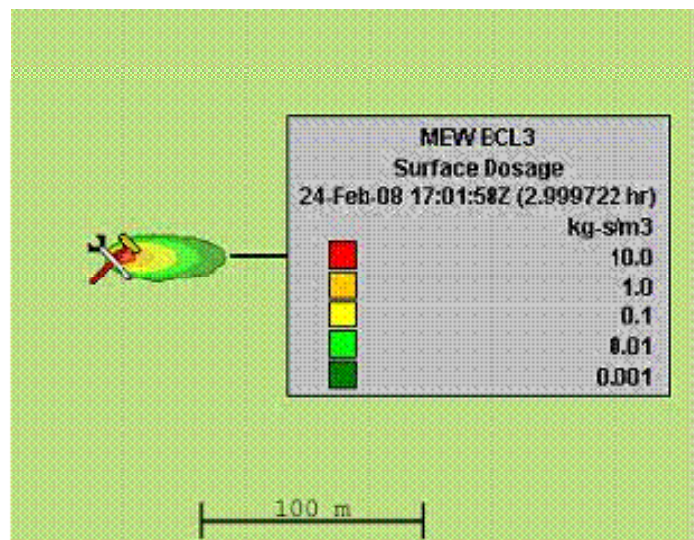




## What's New: Approaches to Development of TIC Protection—Capability in Context

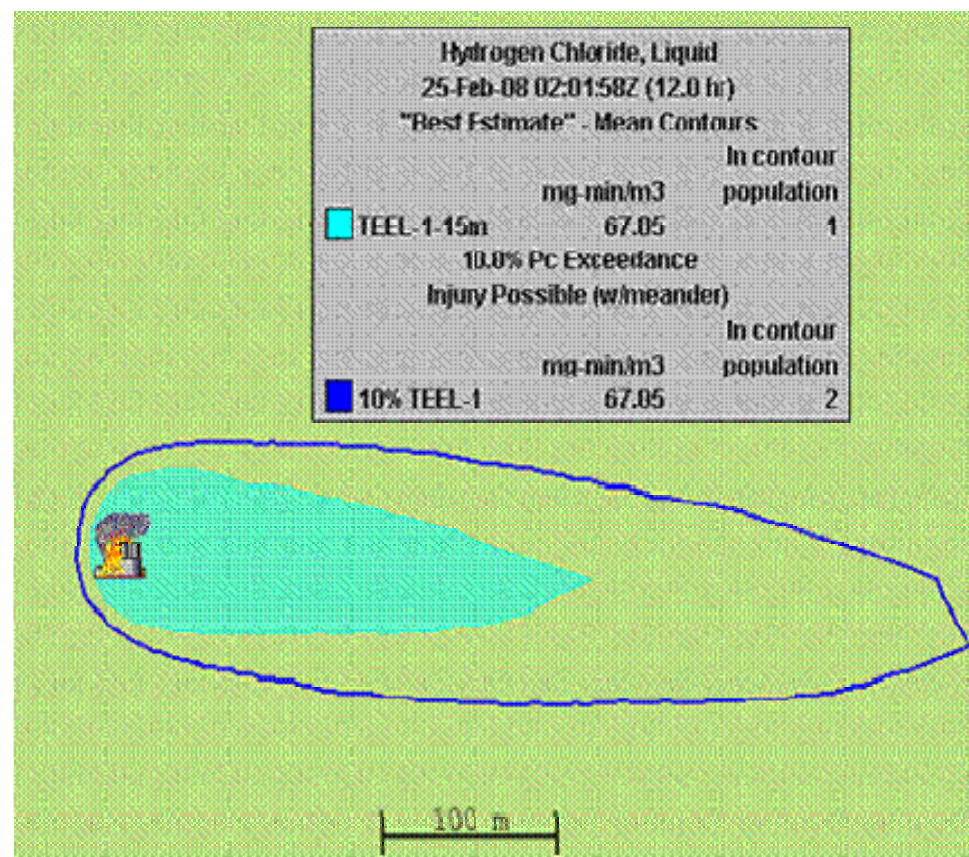


## What's New: Understanding behavior of industrial chemicals in the operational environment



### Inputs:

- (1) Chemical Reactivity
- (2) Decay rate fed into model
- (3) Container Regulations

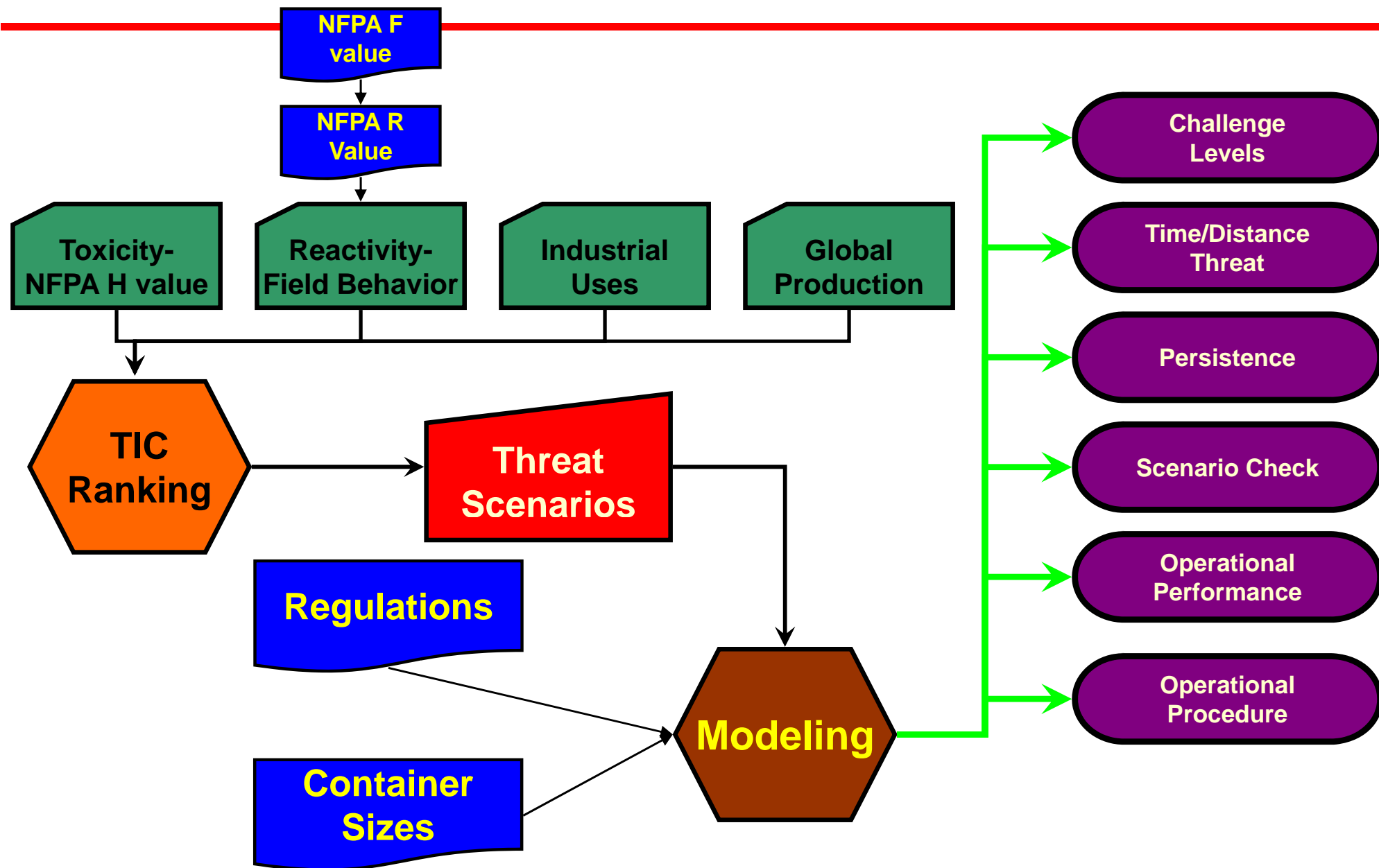


### Outputs:

- (1) Major By-product: Hydrogen Chloride
- (2) Release Modeled as such



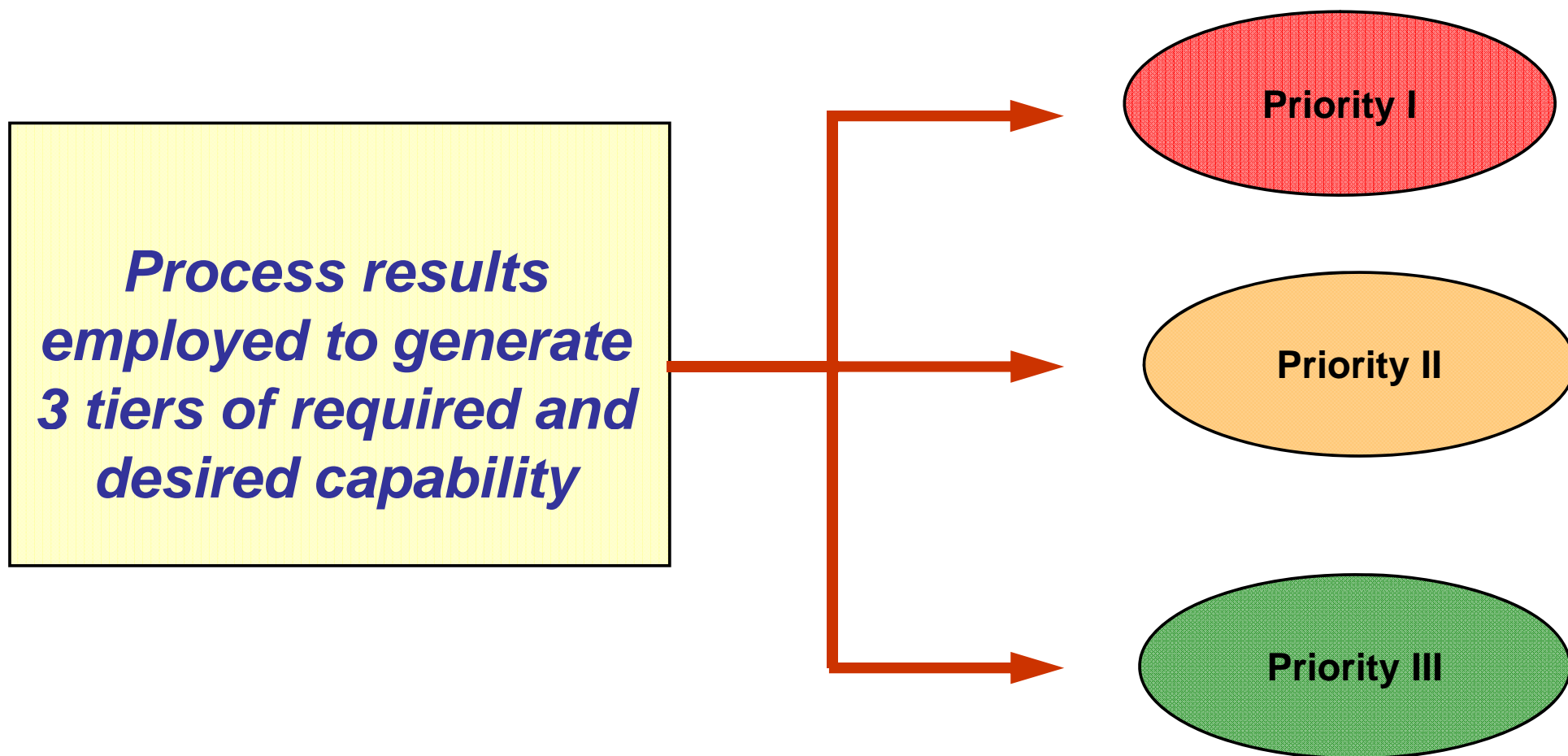
# What's New: Approaches to Development of TIC Protection—JSGPM Prioritization Approach







## ***What's New: Synthesis of 3 Tier Hierarchy of Capability***





# What's New: Preliminary Ranking

Chemical	Production Rating	Usage Rating	NFPA Toxicity Rating	NFPA Flammability Rating	NFPA Reactivity Rating	Reactivity Score	Overall Score	Ranking
Ammonia	4	4	3	1	0	0.5	10.50	
Chlorine	3	4	3	0	0	0	10.00	
Hydrogen Fluoride	2	4	4	0	1	0.5	9.50	
Sulfuric Acid	3	4	3	0	2	1	9.00	
Hydrogen Chloride	3	3	3	0	1	0.5	8.50	
Nitric Acid	3	1	4	0	1	0.5	7.50	
Acrylonitrile*	4	1	4	3	2	2.5	6.50	
The above are the Tier 1 Chemicals								
Sulfur Dioxide	2	1	3	0	0	0	6.00	
Sulfur Trioxide	3	1	3	0	2	1	6.00	
Hydrogen Sulfide	3	1	4	4	0	2	6.00	
Nitrogen Dioxide	1	2	3	0	0	0	6.00	
Allyl alcohol*	4	0	4	3	1	2	6.00	
Acrolein*	4	0	4	3	3	3	5.00	
Formaldehyde	2	2	3	4	0	2	5.00	
Hydrogen Cyanide	3	1	4	4	2	3	5.00	
Boron Trifluoride	1	0	4	0	1	0.5	4.50	
Phosgene	1	0	4	0	1	0.5	4.50	
Methyl isocyanate*	4	2	1	3	2	2.5	4.50	
Hydrogen Bromide	1	0	3	0	0	0	4.00	
Phosphorus Trichloride	1	0	4	0	2	1	4.00	
The above are the Tier 2 Chemicals								
Tungsten Hexafluoride	0	0	4	0	1	0.5	3.50	
Methyl mercaptan*	2	0	4	4	1	2.5	3.50	
Hydrazine*	3	0	4	4	3	3.5	3.50	
Boron Trichloride	1	0	3	0	2	1	3.00	
Carbon Disulfide	2	0	3	4	0	2	3.00	
Fluorine	1	0	4	0	4	2	3.00	
Toluene diisocyanate*	1	0	3	1	2	1.5	2.50	
Phosphine*	1	0	4	4	2	3	2.00	
Ethylene Oxide	2	0	3	4	3	3.5	1.50	
Arsine	0	0	4	4	2	3	1.00	
Diborane	0	0	4	4	3	3.5	0.50	
The Above are the Tier 3 Chemicals								
* Indicates Objective Chemicals								

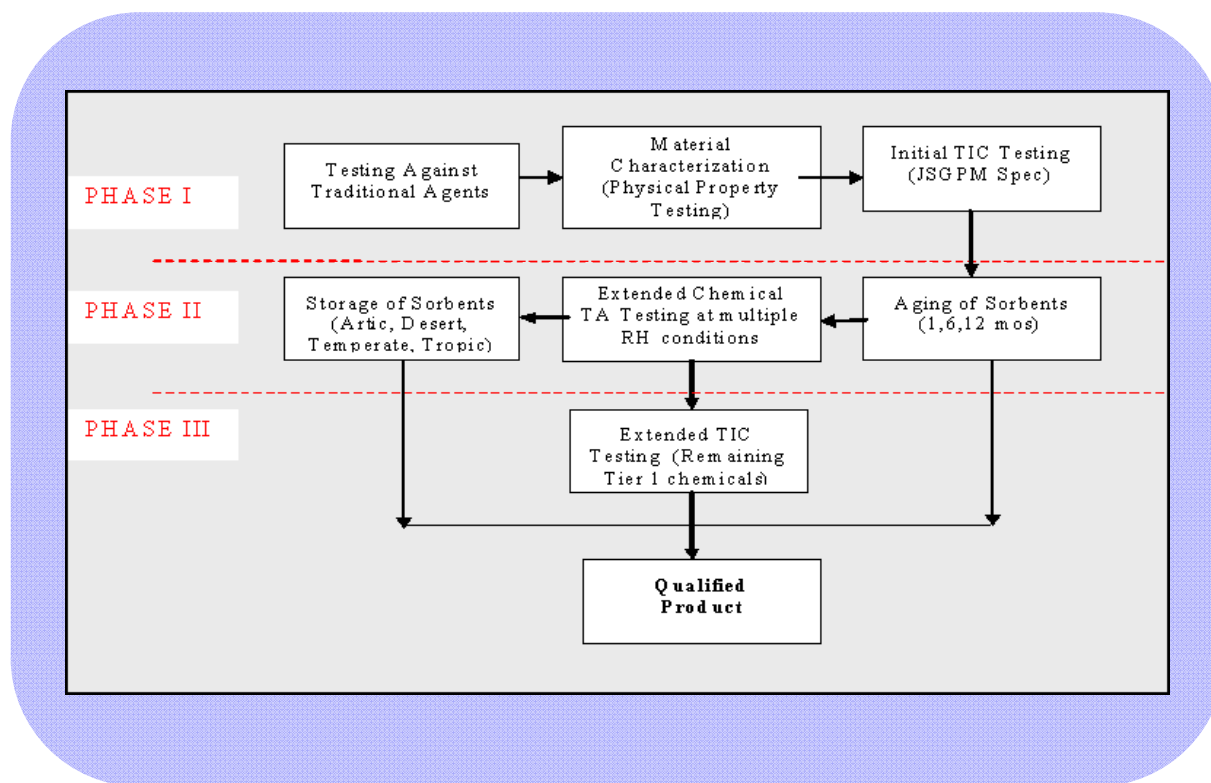
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# What's New: Short Term Technical Strategy

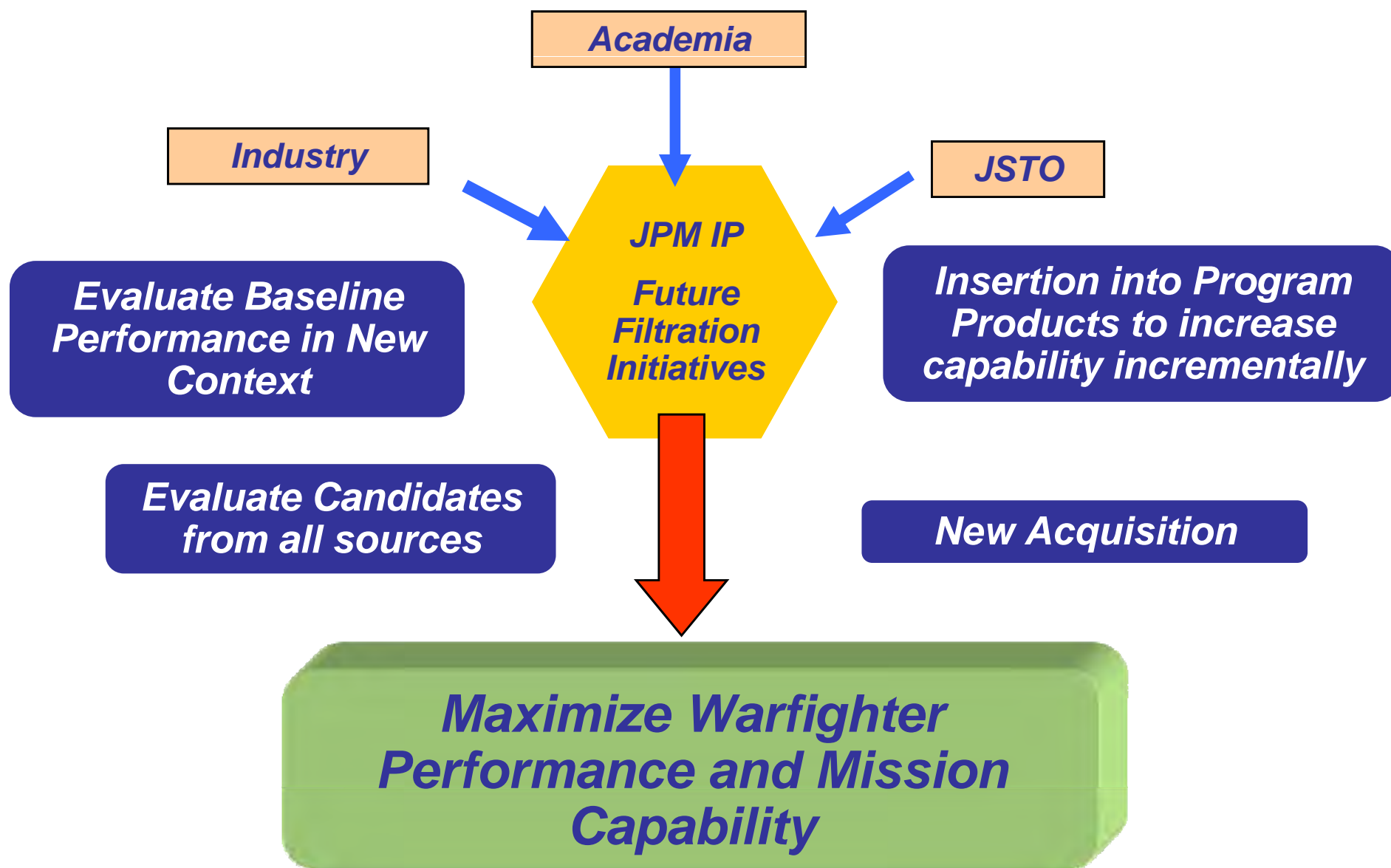
- Pursue promising candidates responding to RFI
- Candidate assessment via FASQ and new material qualification protocols
- Fast Track—contenders move into later phases of assessment quickly



Unclassified



# What's New: Long Term Technical Strategy

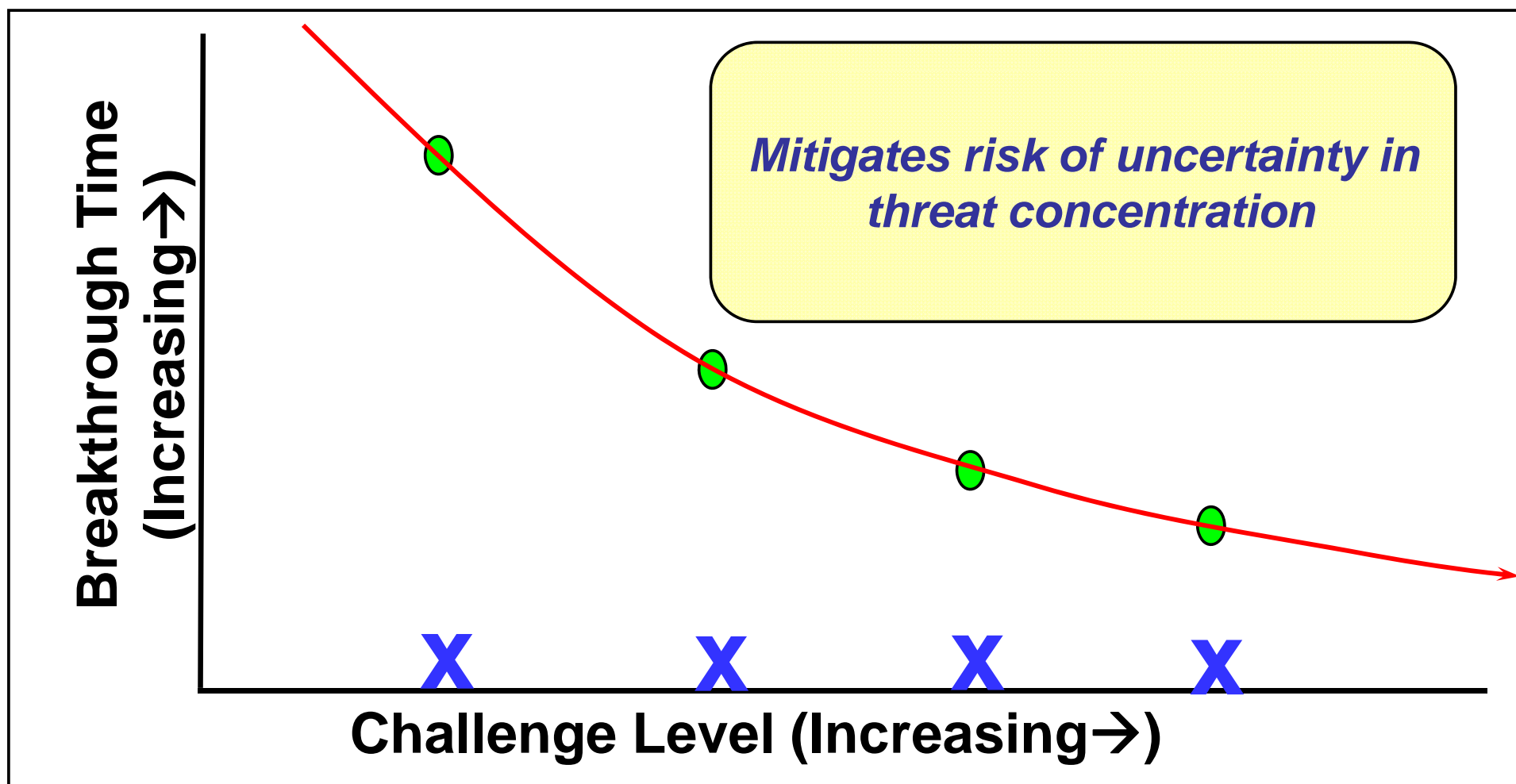


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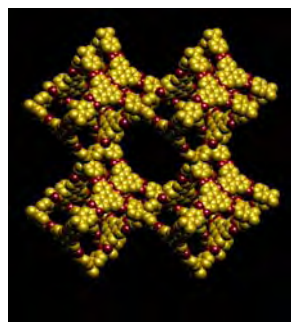
## What's New: Approaches to Development of TIC Protection—How We Test

- Test range of concentrations
  - Performance curve generated vs. single data point
  - Extrapolation of performance for any vignette

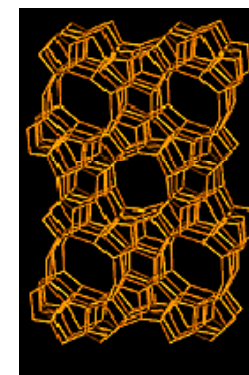


# What are we looking for?

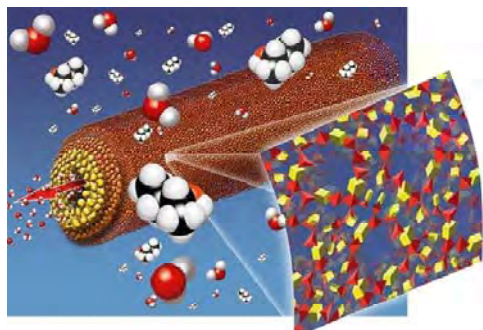
- **Innovative materials**
- **“Frontier ideas”**
  - **Filtration**
  - **Life support gas storage/generation**
- **Range of Technical Maturity**



**“Reticular”  
Chemistry**

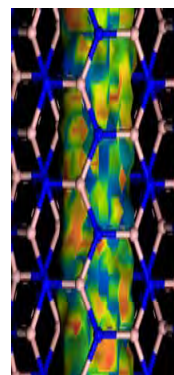
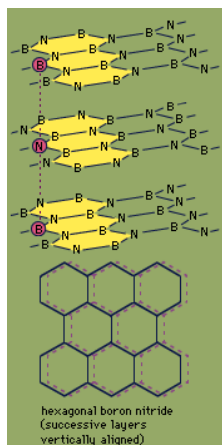


**Zeolites**

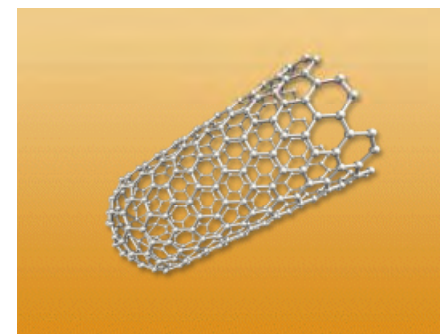


**Hybrid Membrane Technology**

**BN Molecular Architecture**



**Carbon Nanostructures**



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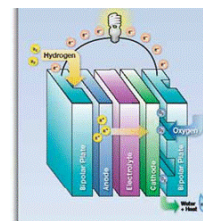
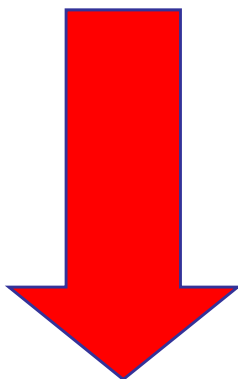
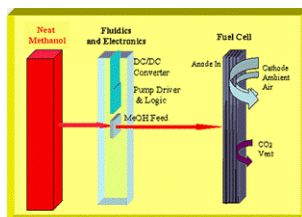
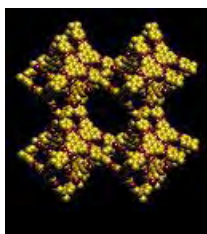


# *What are we looking for?*

## *Creative propagation*

Apply technology created for other purposes as a solution to a new problem:

*Example: Fuel cell technologies*



*Gas storage media*

*Filtration media*

*Future ?*





# What are we looking for?

**Integrated  
CBR/head trauma  
protection?**

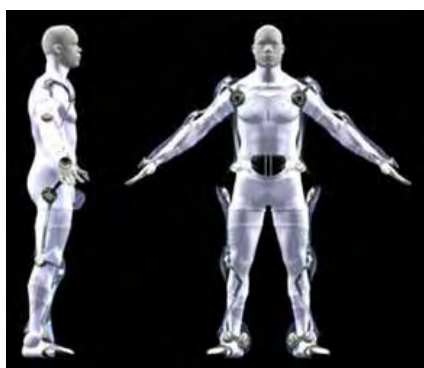


**Tell us what's  
possible  
probable  
practical**

**Lighter, faster  
Level A?**



**Advances in APR/SCBA  
hybrids?**

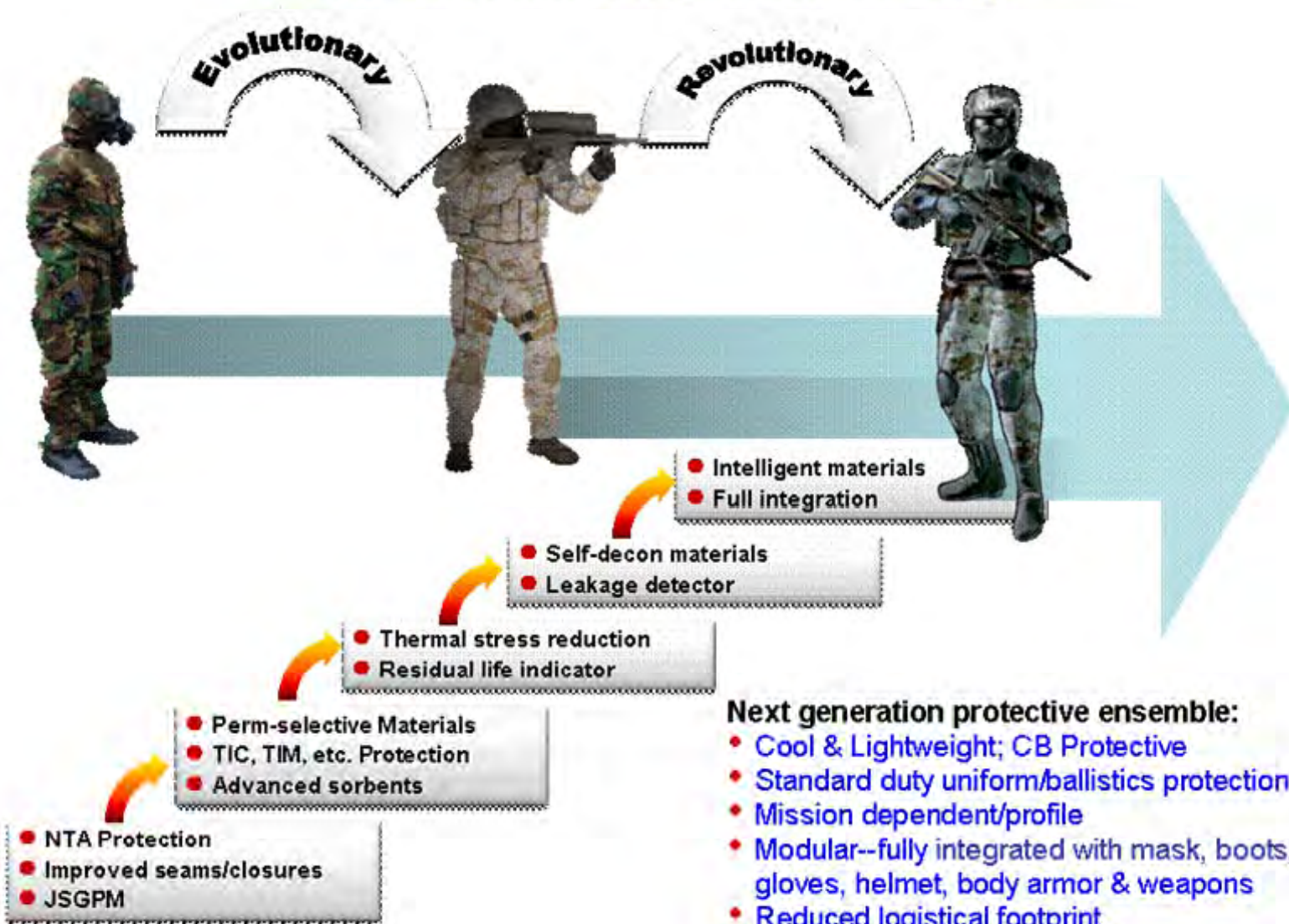


**Tandem  
power/respiratory gas  
generation?**



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## JPM IP Ensemble Acquisition Strategy

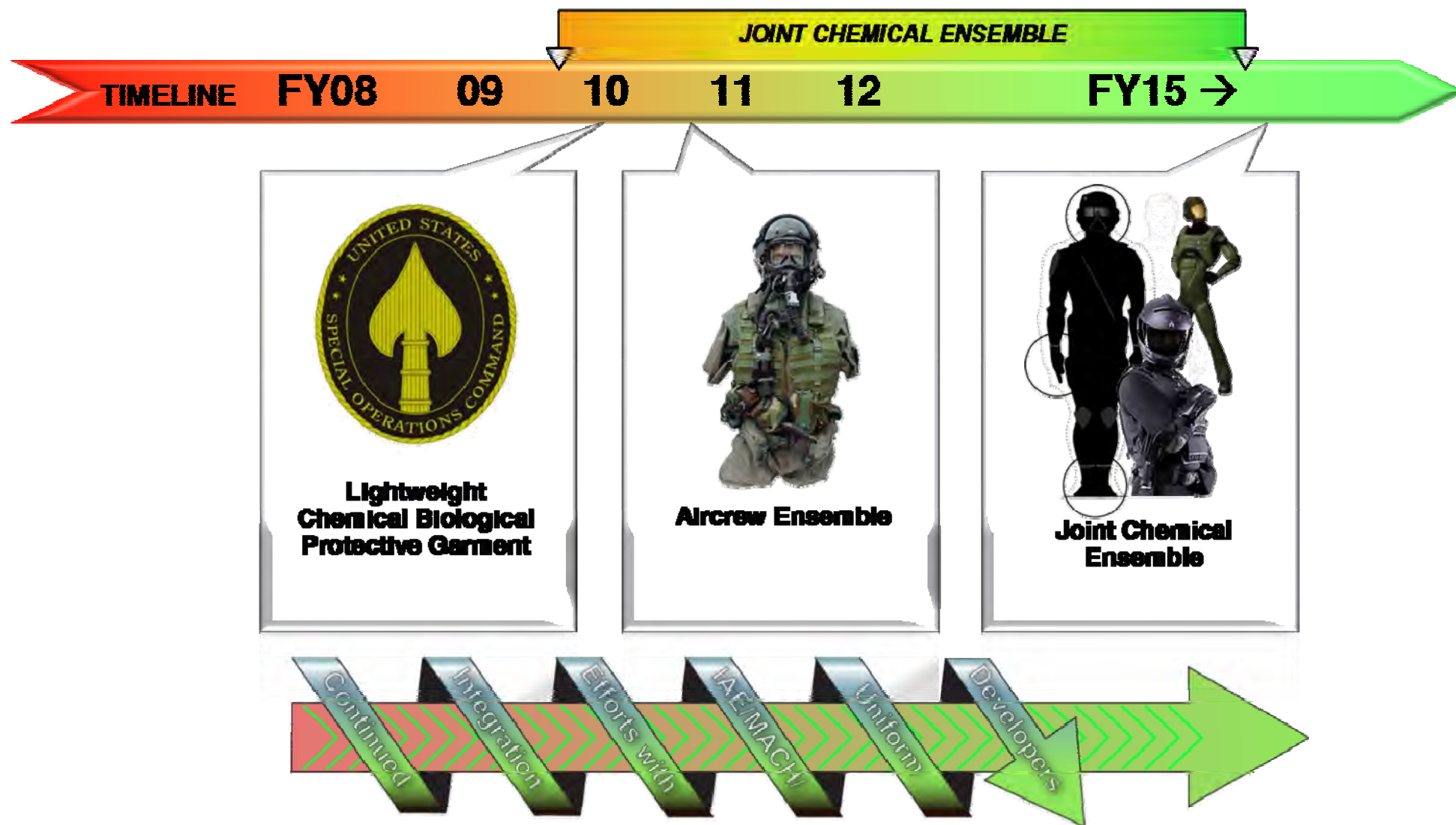


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## JPM IP Ensemble Acquisition Schedule



**“Revolutionary change achieved through Evolutionary gains!”**

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# Upcoming Business Opportunities

PROGRAM	EVENT DESCRIPTION	YEAR
Future Filtration Initiative	RFI Release July 2008	FY08
Lightweight Chemical-Biological Protective Garment	Industry Day Sept 2008	FY08
Joint Chemical Ensemble	Industry Day 3 <sup>rd</sup> Qtr-FY10 for Potential Aviation Ensemble Improvements	FY10
Joint Chemical Ensemble	Next Generation Protective Ensemble RFI Release 3 <sup>rd</sup> Qtr-FY12	FY12



# ***JPM IP Points of Contact***

- **Joint Project Manager – Individual Protection**
  - Mr. William D. Hartzell
  - (703) 617-2444
  - [william.hartzell@usmc.mil](mailto:william.hartzell@usmc.mil)
- **Deputy Joint Project Manager – Individual Protection**
  - Mr. Mike Stevens
  - (703) 617-2440
  - [joseph.m.stevens@usmc.mil](mailto:joseph.m.stevens@usmc.mil)
- **Director, Test & Evaluation, Program Lead, Future Respiratory Protection Initiative**
  - Dr. Karen McGrady
  - (703) 617-2441
  - [karen.a.mcgrady@usmc.mil](mailto:karen.a.mcgrady@usmc.mil)
- **Director, Future Acquisition**
  - Dr. Gene Stark
  - (703) 617-2439
  - [gene.stark@usmc.mil](mailto:gene.stark@usmc.mil)
- **Director, Systems Engineering**
  - Ms. Deborah Singleton
  - (703) 617-2427
  - [deborah.singleton@usmc.mil](mailto:deborah.singleton@usmc.mil)
- **Director, Logistics**
  - Mr. Robert Wattenbarger
  - (703) 617-2410
  - [robert.wattenbarger@usmc.mil](mailto:robert.wattenbarger@usmc.mil)





## ***Future Respiratory Protection Initiative Points of Contact***

---

- **Mr. Nick Hanak**
  - Project Manager, Future Respiratory Protection Initiative
  - (703) 617-2467
  - [nhanak@jrad.us](mailto:nhanak@jrad.us)
- **Mrs. Brenda Russell**
  - Test Coordinator
  - (703) 617-2446
  - [russellbs@jpmoip.org](mailto:russellbs@jpmoip.org)



# Filter Testing-Performance Analysis and Performance Enhancement

Thomas E. Sutto, Ph.D.  
Material Science and Technology Division,  
Naval Research Laboratory



# Objectives of Testing

**Part 1: What to test?**

**Part 2: How to test it?**

**Part 3: How to translate laboratory testing to meaningful data to the user community.**





# Industrial Chemicals



These few selected industrial uses are only a small subset of the over **5000** chemical manufacturing and processing facilities worldwide.

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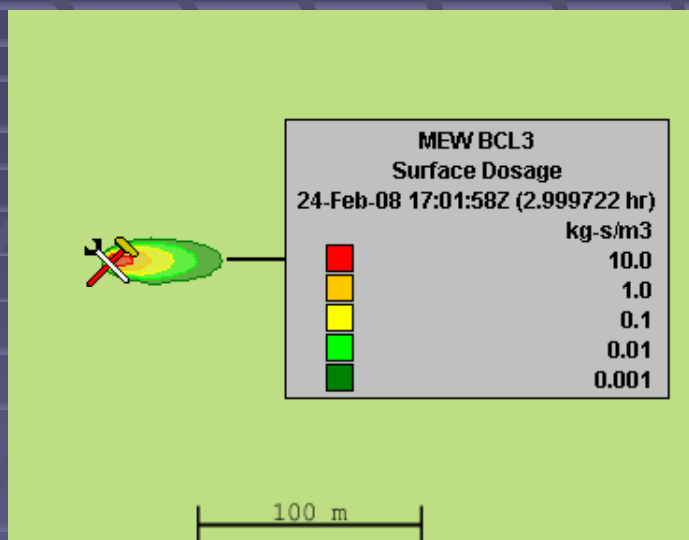
## What to test?

1. Over 5000 chemical facilities worldwide
2. An even greater number of distributors
3. TIC prioritization focused on a comprehensive risk management of what we do not know:
  - Absolute global production levels
  - Absolute global distribution amounts



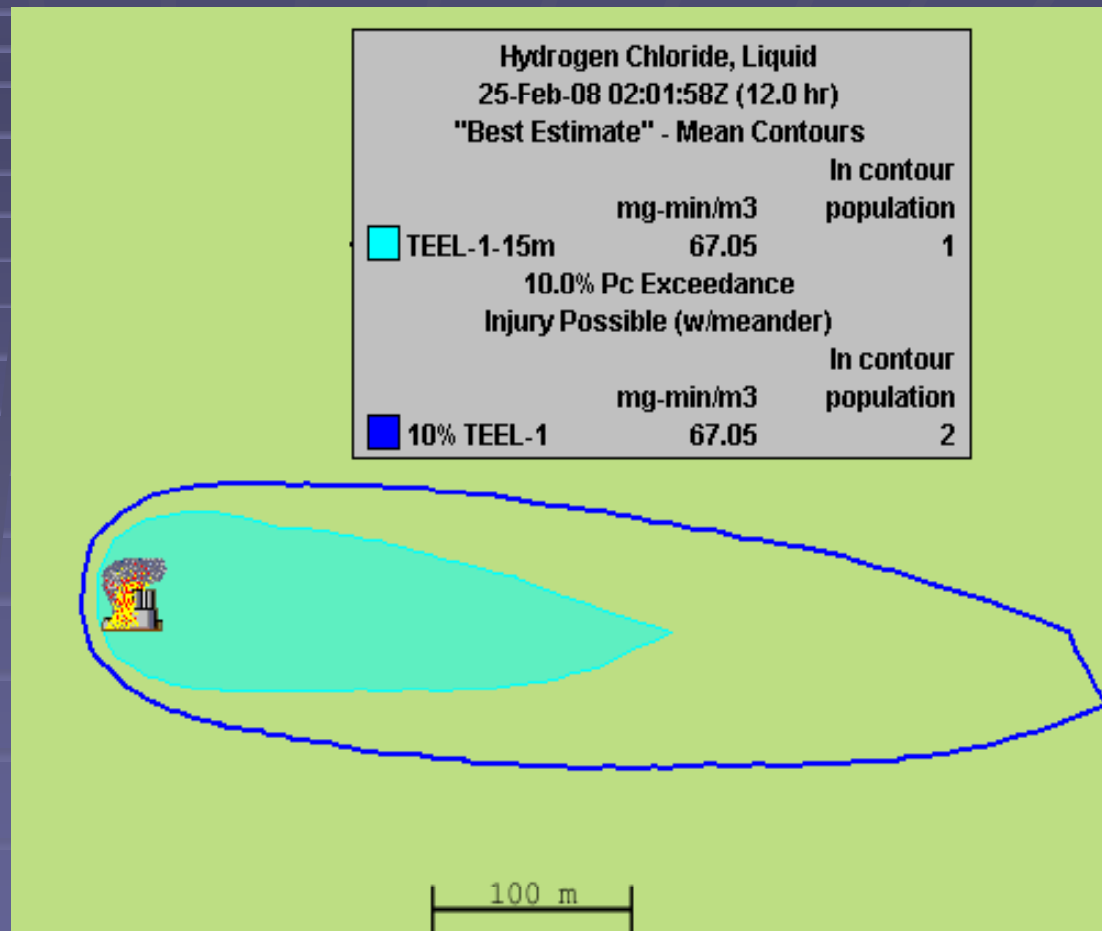


# Assess the actual environmental hazard



## Inputs:

- (1) Chemical Reactivity
- (2) Decay rate fed into model
- (3) Container Regulations



## Outputs:

- (1) Major By-product: Hydrogen Chloride
- (2) Release Modeled as such



# How to test?

## 1. Challenge Levels

- Scenario Modeling (For T&E purposes)
- Vignette Modeling (For operational analyses)

## 2. Breakthrough Levels

## 3. Detection Approaches

- Multiple species may be present

## 4. Chemical Class Analysis

## 5. Humidity Effects



# Scenario Modeling

## For each prioritized TIC:

1. Utilize DOT/UN transport regulations to determine large, moderate and asymmetric releases.
2. Determine maximum challenge levels at set distances
  - (100, 500, 1000 meters)
3. Consider operational relevance to challenges.
  - At 100 meters from a large rail car explosion-is the threat an inhalation hazard or a blast hazard?



# Challenge Levels

## Test a range of concentrations (Scenario Driven)

- Performance curve generated vs. single data point
- Extrapolation of performance for any vignette



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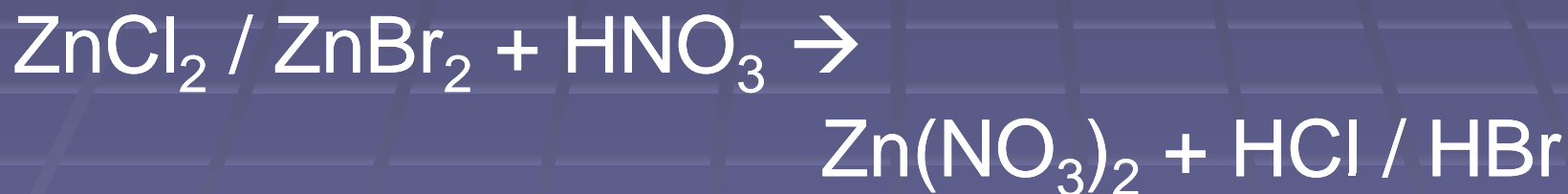


## How to detect?

Consider  $\text{NO}_2$ :

Humidity – partial conversion to  $\text{HNO}_3$  and  $\text{HNO}_2$

Reactions with different impregnates:



**Develop capability for in-line detection of multiple species.**





# How to detect?

One example:

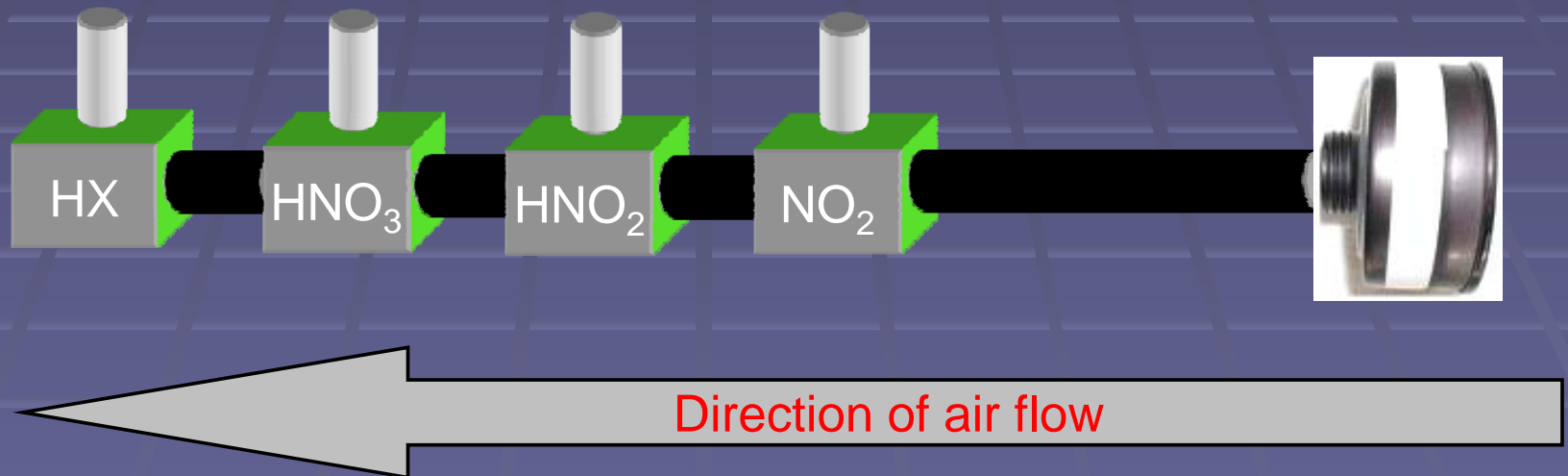
- Use of ion selective-electrochemical sensors
- Commonly available for industry
- Below lists a few of those with high sensitivity and limited cross interference

<b>Acrylonitrile (AN)</b>	<b>Fluorine (F<sub>2</sub>)</b>	<b>Nitric Acid (HNO<sub>3</sub>)</b>
<b>Ammonia (NH<sub>3</sub>)</b>	<b>Formaldehyde</b>	<b>Nitric Oxide (NO)</b>
<b>Arsine (AsH<sub>3</sub>)</b>	<b>Hydrazine (N<sub>2</sub>H<sub>4</sub>)</b>	<b>Nitrogen Dioxide</b>
<b>Benzene (C<sub>2</sub>H<sub>6</sub>)</b>	<b>Hydrogen Bromide</b>	<b>N<sub>2</sub>O</b>
<b>Bromine (Br<sub>2</sub>)</b>	<b>Hydrogen Chloride</b>	<b>Ozone (O<sub>3</sub>)</b>
<b>Butadiene (C<sub>4</sub>H<sub>6</sub>)</b>	<b>Hydrogen Cyanide</b>	<b>Phosgene (COCl<sub>2</sub>)</b>
<b>Carbon Monoxide</b>	<b>Hydrogen Fluoride</b>	<b>Phosphine (Ph<sub>3</sub>)</b>
<b>Chlorine (Cl<sub>2</sub>)</b>	<b>Hydrogen Sulfide</b>	<b>Styrene</b>
<b>Cyclohexane</b>	<b>MEK (CH<sub>3</sub>COC<sub>2</sub>H<sub>5</sub>)</b>	<b>Sulfur Dioxide</b>
<b>Ethylene Oxide</b>	<b>Methyl Bromide</b>	<b>Vinyl Chloride</b>



# How to detect?

## Simple t-cell detection set-up





# Class Based Analysis

## Dual Use of a chemically based Class Analysis

- Risk mitigation of the unknown absolute scoring of a chemical's presence globally.
- Class based analysis to assess filter performance against other related chemicals not tested.



# Chemical Classes in Prioritization



**Oxidizers-includes “acid gases”, and “acid forming gases” such as chlorine or fluorine.**

**Reducers-includes ammonia and the other hydrides, as well as the hydrazines and amines.**

**Lachrymators- self-polymerizing “tear causing chemicals”→ acrylonitrile, acrolein, allyl alcohol, methyl isocyanate and phosgene.**

**Volatile Organics- simple, volatile solvents such as carbon disulfide or carbon tetrachloride.**

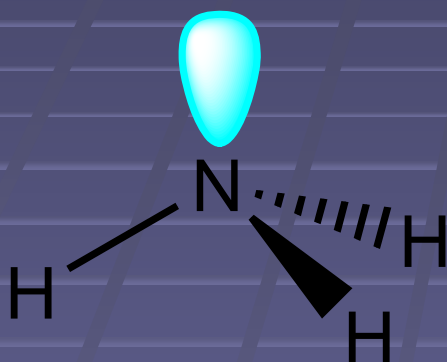
**Pest/Herbicide-called due to toxicity, stability and current/past global distribution**

**From initial ranking, select those with the highest scores in each Class to ensure that all classes are represented.**

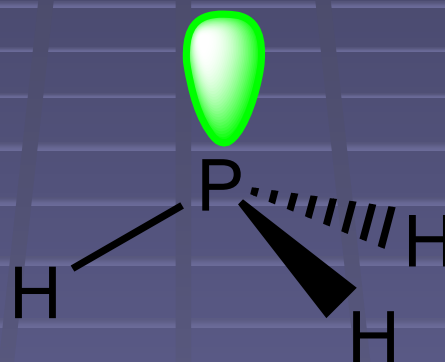


# Class Based Analysis in Filter Testing

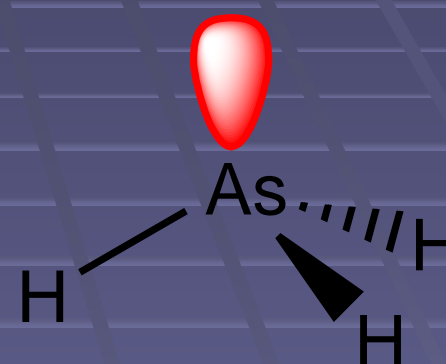
Ammonia



Phosphine



Arsine



Increasing reactivity (stronger reducing agent)

Increasing stability in the environment

Increasing ability to filter (increasing capacity)





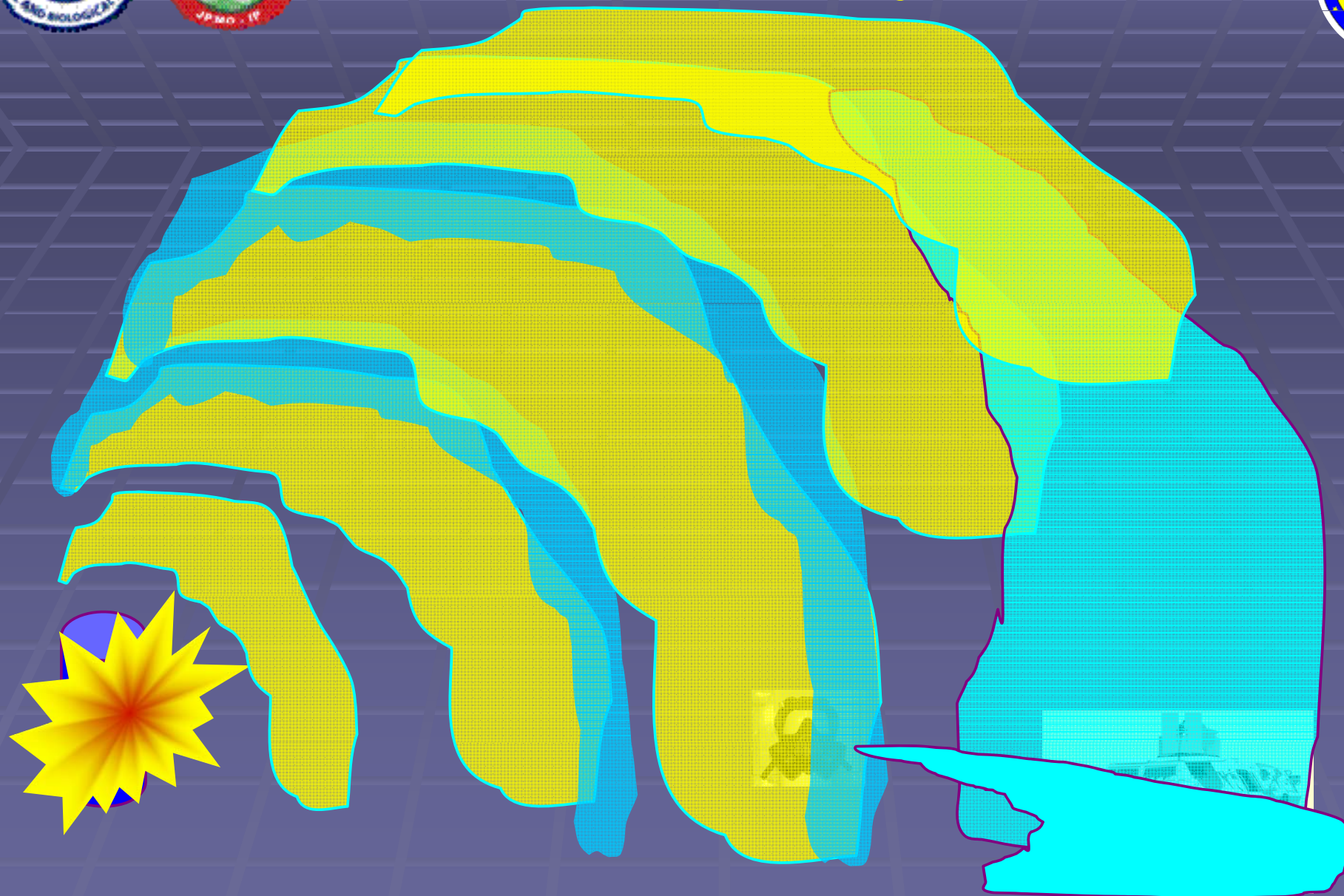
# Humidity Effects and Anhydrous Gases

Anhydrous gases present a two-fold challenge:

1. Upon release in the environment-conversion to an aerosol hazard
  - HCl gas to aerosolized hydrochloric acid
  - HBr gas to aerosolized hydrobromic acid
  - $\text{NH}_3$  gas to aerosolized ammonium hydroxide
2. Second hazard occurs behind this expanding aerosol hazard-a zero humidity challenge



# Aerosol Hazard of Anhydrous Gases



**HCl Vapor**

**Hydrochloric Acid Aerosol**

Unclassified



## Utilizing Filter Performance data for Operational Assessments

### Based upon performance curve data:

- Estimate operational time at IDLH values or AEGL-3 values

### Based upon scenario modeling and performance curve data

- Estimate operational time at specific distances for large, moderate and asymmetric types of releases.





# Conclusions

1. What to test based on a comprehensive risk mitigation strategy
2. How to test-lessons learned from previous T&E as well as fundamental chemistry
3. Simple, low cost approaches to breakthrough detection
4. Two fold use of Class Based Analysis
  - Risk mitigation during prioritization
  - Performance assessment during T&E and operational analysis
5. Humidity effects-Test at the most challenging (zero humidity?)
6. Utilize performance curve data to translate laboratory test data to operationally relevant filter performance.



Joint Program Executive Office for Chemical and Biological Defense

Joint Project Manager for Individual Protection

# ***Reducing the Logistics Burden for Individual and Collective Protection***

## **Joint Project Manager for Individual Protection and Collective Protection Industry Day**



[specwargear.com](http://specwargear.com)

**R.D. (Bob) Wattenbarger**  
Director, Life Cycle Management and Logistics  
JPMO – Individual Protection  
[robert.wattenbarger@usmc.mil](mailto:robert.wattenbarger@usmc.mil)



**Dustin T. Green**  
Logistics Manager  
JPMO – Collective Protection  
[dustin.t.green@navy.mil](mailto:dustin.t.green@navy.mil)

Distribution Statement A. Approved for public release; distribution is unlimited.

Joint Program Executive Office for Chemical and Biological Defense

Joint Project Manager for Collective Protection







## PURPOSE

- To discuss logistics issues associated with individual respiratory and collective protection through...
- Identifying Current Issues
- Considering Future Technology Sustainment
- Exploring Sustainment Trade-offs
- Reducing the Logistics Footprint
- Optimizing the Industrial Base





## CURRENT STATE

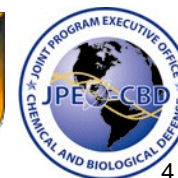




## WHAT'S CHANGED?



Today





## CURRENT IP ISSUES

- Shelf Life...variable based on testing
- Wear Time...subjective based on environment
- Packaging, Marking, Asset Visibility
- Unique filters for unique threats
- Production
  - Quality
  - Sustainment/preservation

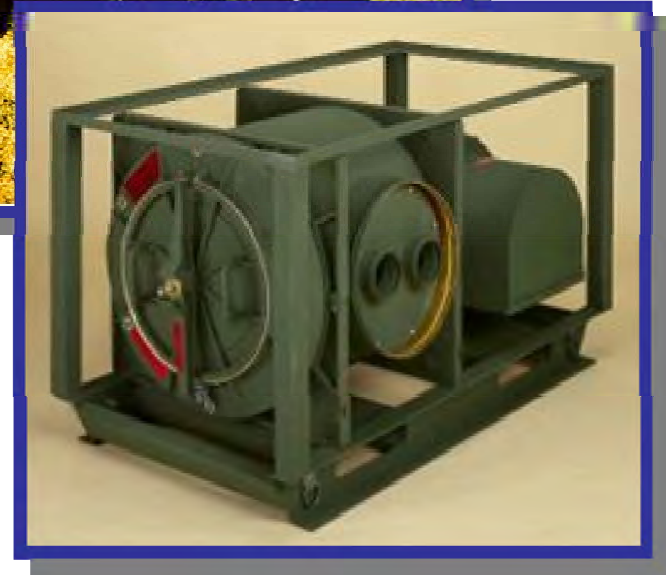
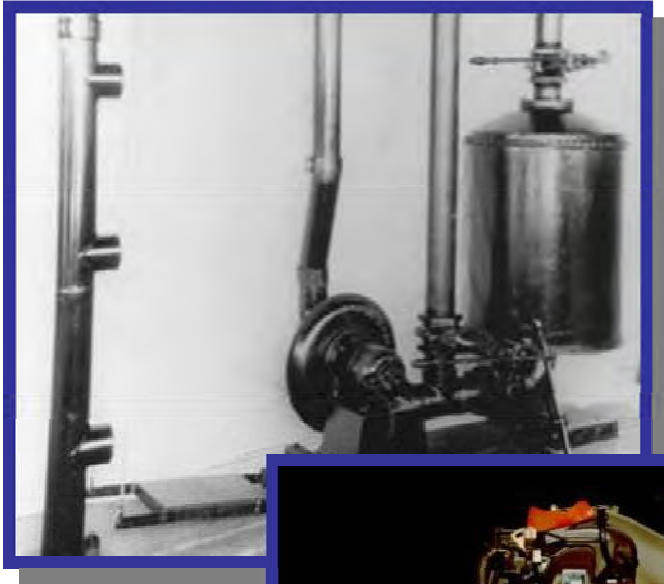
*Increased Logistics Footprint*







## WHAT'S CHANGED?







# CURRENT COLPRO ISSUES

- **Shelf Life Extension**

- Cost of test to extend
- Cost of items consumed in testing
- Small lots not economical to test



- **Filter Life**

- Differences in Concept of Operations precipitates different change-out criteria
- Residual Life influenced by environment





# COLPRO OUTLOOK

- **Performance Specifications**
  - Filters are transitioning to performance specifications
  - Opportunities to improve on legacy designs in packaging, marking, and transportation
- **Performance Based Logistics**
  - Business Case Analysis to be conducted within...
    - Chemically & Biologically Protective Shelter Program
    - Joint Expeditionary Collective Protection Program
    - Legacy Systems
  - Provide the optimal mix of Organic and Contractor support





# FUTURE TECHNOLOGIES DESIRES AND CONCERNS



## Desires

- Serviceability Indicators...Residual Life
- Reduction or elimination of special use filters
- Low cost durable packaging...package for recovery

## Concerns

- Positive pressure...reliability & maintainability
- Integration issues...soldier as a system
- Power source...stand alone or integrated
- Disposal of new filter media
- Increase in logistics footprint





# NEW TECHNOLOGY SUSTAINMENT

- New technologies will require new logistics support strategies
- Passive filtration technologies can draw on Individual Protection sustainment expertise with similar technologies
- Maintenance focused logistics vs. consumable item management
- Reusable filtration technologies may require trade-offs to sustainment support





# SUSTAINMENT TRADE-OFFS

- Tradeoffs are usually focused between logistics and performance... what trade-offs exist WITHIN logistics to provide the best support to the warfighter?
- Modular Sustainment vs. Residual Life Indicators
  - Fixed change-out criteria
  - Change-out criteria based on indicators
- Shelf Life Testing vs. Disposal
  - Longer, non-renewable shelf life
  - Shorter, renewable shelf life
- Useful Life vs. Shelf Life
  - Balancing the investment to withstand field conditions with the ability to withstand storage







## REDUCTION IN FOOTPRINT

- Small Changes have large effects.



- Large Issues have small solutions.





# INDUSTRIAL BASE

- **Survivable**
  - Creating an industrial base that functions during wartime and peacetime.
- **Responsive**
  - Minimize impact to the warfighter in large scale conflicts and small scale contingencies
- **Sustainable**
  - Mitigating single points of failure through public-private partnerships.





## FUTURE STATE



**NEGATIVE  
PRESSURE**



**POSITIVE  
PRESSURE**





## CONCLUSION

- Current Logistics issues are not new
- Future technologies can address many of our current issues; however they present new logistics issues that will require new sustainment strategies
- Sustainment Trade-off Analysis provides valuable insight into the relationship of logistics elements associated with a given technology and allows for a balanced, best value sustainment strategy
- A survivable, responsive and sustainable Industrial base is critical in sustaining future technologies
- COLPRO and IP are exploring opportunities for collaboration on integrating new technologies







## QUESTIONS?







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# ***JPM-ColPro Product Director CBRN Filtration Needs***

## **Joint Project Manager for Individual Protection and Collective Protection Industry Day**

**Nicholas Yura**  
**Product Director for Mobile Collective Protection Systems**  
**Nicholas.Yura@us.army.mil**



# Agenda

- Vision
- ColPro Basics
- PD Mission/Services
- CBRN Threat
- CBRN Purification Goals
- CBRN Purification Element Needs
- CBRN Purification System Needs
- Summary
- Contact Information



# PRODUCT DIRECTORS VISION

- Are the recognized “GO TO” source for ColPro expertise within DoD
- Provide “CUTTING EDGE” ColPro capabilities to all Users
- Establish relationships with industry to provide optimal ColPro capabilities to all Users
- Serve as the ColPro technology/integration “Honest Broker” for platform Program Managers
- Offer the optimum level of support while being flexible enough so as not to be a hindrance.

# Why Collective Protection?

**Hazardous environments can be created by conventional or asymmetric means --- ColPro:**

- **Provides safe operational areas that:**
  - Affords shirt-sleeve environment
  - Prevents infiltration & the spread of contamination
  - Provides clean, breathable air
  - Reduces the need for decontamination
- **Typically protects areas or zones such as:**
  - Command and control
  - Medical care
  - Mission critical
  - Rest and relief
  - Weapon system control



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# Collective Protection Basics

- Where is Collective Protection typically required?
  - **Command/control areas**
  - **Medical areas**
  - **Rest/relief areas**
- Collective Protection Applications:
  - **Mobile**
    - ✓ **Vehicles, ships, aircraft**
  - **Transportable**
    - ✓ **Portable shelters, tents, containers**
  - **Fixed Site**
    - ✓ **Buildings, permanent shelters or temporary shelters**



# Collective Protection Systems



**Self-contained  
Transportable/Mobile Collective  
Protection System**



**Transportable Collective  
Protection Systems**



**Transportable Collective Protection  
Systems**



**Fixed Site Collective Protection**



**Mobile Collective Protection**



**Shipboard Collective Protection**



# JPM-ColPro Product Directors

- Charter:

“Serve as the Joint Program Manager-Collective Protection’s focal point for providing overall direction and guidance for research, design, development, testing, procurement, fielding and provide life cycle oversight for Collective Protection equipment and systems for platforms that provide contamination free areas to protect personnel and equipment against Chemical, Biological, Radiological, Toxic Industrial Material threats.”



# PD Services

## • Examples:

- Input to requirements documents
- Execution of ColPro technology tradeoff studies
- Preparation of contractual document input
- Preparation of test plans
- Preparation of technical /training manuals
- Serve as contract ColPro area technical monitors

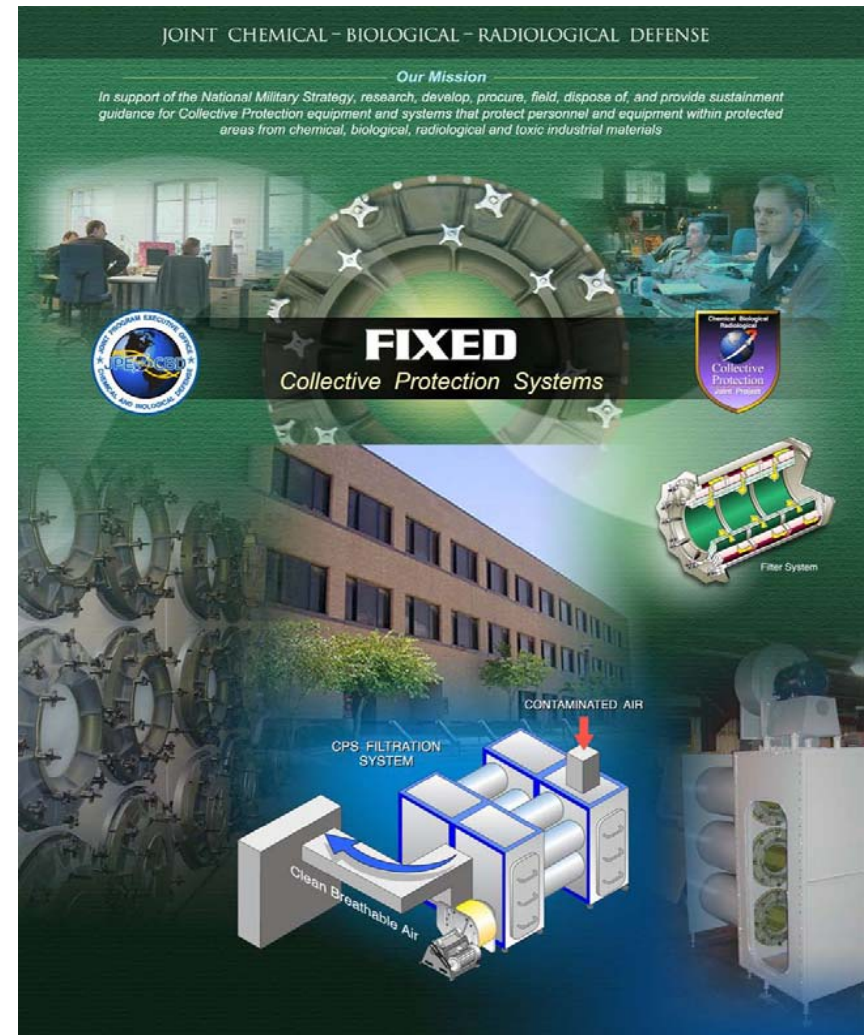


# Product Director – Fixed CPS

## *Product Director – Mr. Walt Dzula, NSWC Z23*

### FCPS Program Support

- Department of Homeland Security
- Department of State
- JPM-Guardian: On-Demand ColPro System
- Major Commands
- MILCON



***Protection for critical facilities and/or discrete critical areas within facilities***





# Product Director – Mobile CPS

*Product Director – Mr. Nick Yura, RDECOM*

## MCPS Program Support

- Airborne Mobile Platforms
- Analytical Laboratory System
- Expeditionary Fighting Vehicle
- Future Combat Systems
- Joint Light Tactical Vehicle
- Light Armored Vehicle
- M1 Abrams Main Battle Tank
- M2/M3 Bradley Fighting Vehicles
- Medium Mine Protected Vehicle
- Mine Resistant Ambush Protected
- Unmanned Aerial Vehicle



***Protection for capital assets such as tracked and wheeled vehicles***

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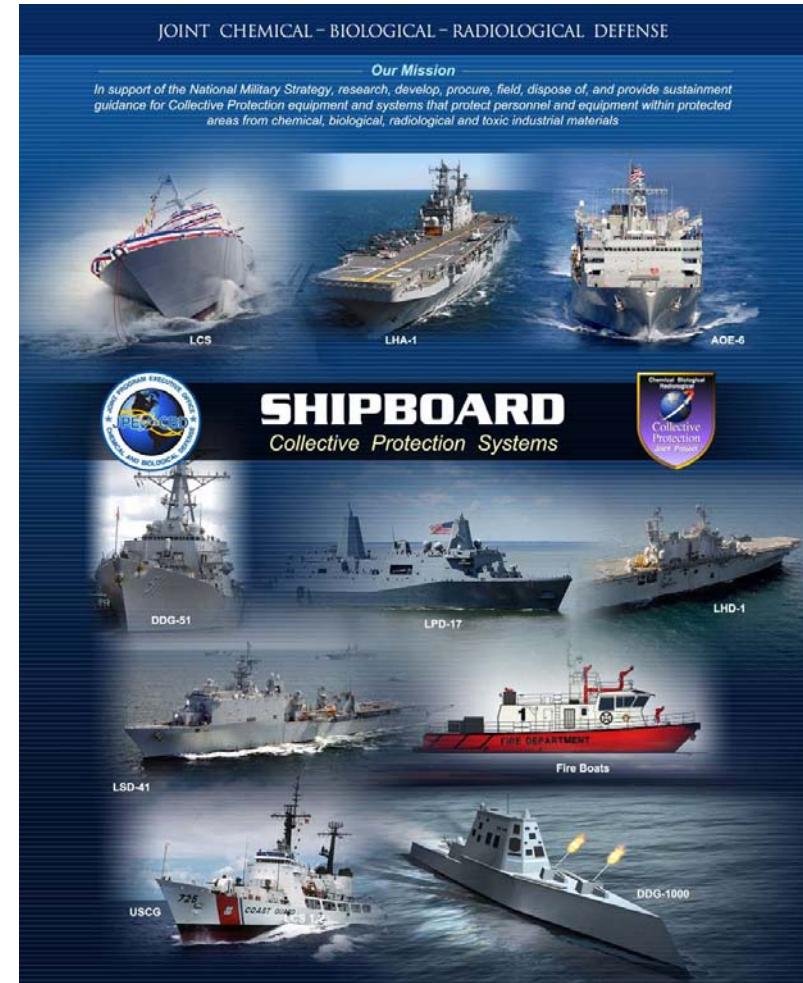


# Product Director – Shipboard CPS

## *Product Director – Mr. Chip Warder, NSWC Z23*

### SCPS Program Support

- Amphibious Assault Ship Replacement
- Amphibious Transport Dock
- Guided Missile Destroyer/Cruiser
- Joint Maritime Assault Connector
- Littoral Combat Ship



*Protection for capital ships such as destroyers  
and the amphibious fleet*



# Product Director – Transportable CPS

*Product Director – Mr. Steve Beaudoin, NSRDEC*

## TCPS Program Support

- Ballistic Missile Defense
- Combat Support Hospital Modernization
- Defense Threat Reduction Agency
- Force Provider



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***Protection for assets such as field hospitals,  
tactical command posts, soft and hard shelters***

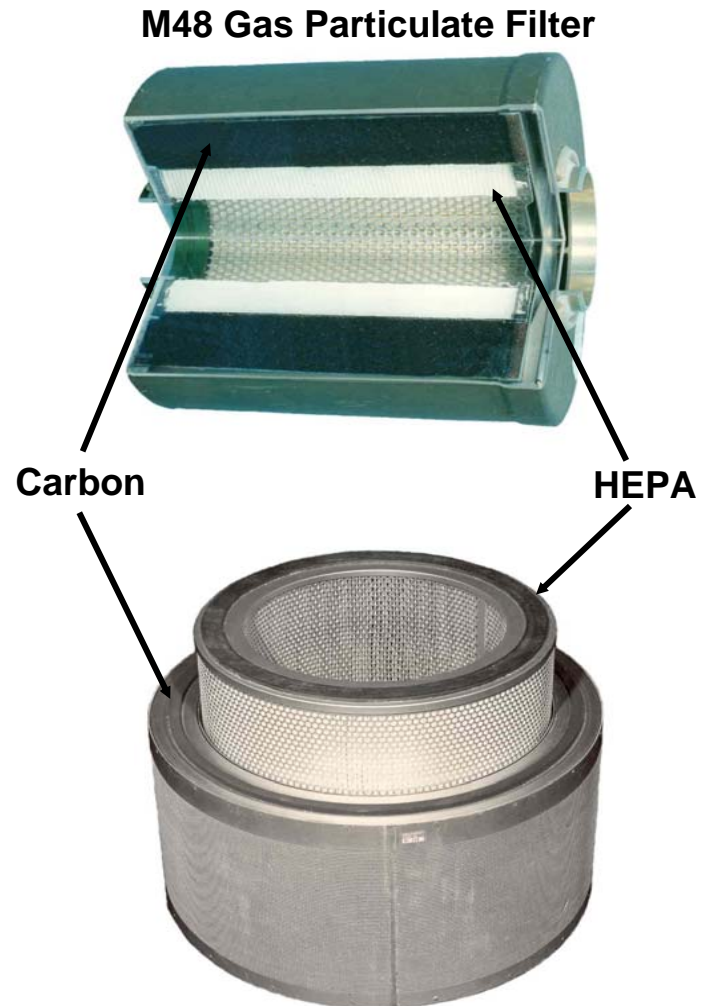
# CBRN Purification Threats

- **Employment Forms**
  - Vapors, aerosols, and particulates.
- **Chemical**
  - Classical Chemical Warfare agents
  - Future agents
  - Toxic Industrial Materials/Toxic Industrial Chemicals
- **Biological**
  - Bacteria, spores, toxins
- **Radiological**
  - Radioactive fallout
  - Dirty Bombs



# Single Pass Filtration

- Consists of a combination of high efficiency particulate air (HEPA) filter and a chemically treated carbon adsorbent.
  - ✓ A HEPA removes liquid droplets, aerosols, and solid particulate to an efficiency of 99.97% @ 0.3 microns
  - ✓ Chromium-free activated carbon, impregnated with Copper, Silver, Zinc, Molybdenum, and Triethylenediamine (ASZM-TEDA) removes nerve and mustard agents by adsorption alone and blood agent removal is aided by a reaction with chemicals impregnated on the carbon.
- Capabilities
  - ✓ Simple, low cost system, currently fielded
  - ✓ Protects against classical CBRN agents and some TICs/TIMs
  - ✓ Requires filter change out based on estimated usage



**M98 Gas Particulate Filter Set**





# Air Purification Goals

- Effective against all current and future postulated toxic materials
- Minimal impact to platforms
- Reconfigurable and modular for multitude of platforms
- No/Minimal logistical/maintenance burden

**System is TRANSPARENT to the User/PROTECTION is Apparent**



# PD CBRN Purification Needs

- CBRN Threats
- Integration Needs
- Residual Life Indicator



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# CBRN Threat Needs

- Purification/Filtration elements with lower pressure drop
- Increased capability against current and evolving CBRN threats to include
  - TICs/TIMs
  - Future agents
- Reduced filter/removal element changeout



# Integration Needs

- Designed for Modularity, Component Flexibility, and Tradability
  - Diverse range of applications.
  - No one size fits all
  - Resource Availability is Variable
- Integratable into standard Air Handling Units
- Reduced Size
- Decreased Weight
- Lower cost/easier to manufacture



# Residual Life Indicator Needs

- Failsafe (No false alarms)
- Minimal resources required
- Signal easy to observe
- Inexpensive
- Easy to integrate into all filters
- Effective for all agents

# PD CBRN Purification System Needs

- Lightweight
- Easy to integrate
- Minimal maintenance
- Inherent to the host platform
- Reduced power
- Inexpensive
- Variable Speed Motor Blowers
- Qualified for entire range of PD platforms operational environments
- Adaptable to wide range of platforms







# SUMMARY

- PDs being established as “go to” ColPro source for platforms, for ALL phases of development and sustainment
- Wide diversity of platforms needing ColPro
- Need for CBRN Purification elements with:
  - Increased capabilities
  - Minimal impact to applications
  - Reduced logistical burden

# OUR CUSTOMERS



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# Contact Information

- **Product Director: Fixed Site Collective Protection**

Walter Dzula

Walter.Dzula@navy.mil

- **Product Director: Mobile Collective Protection**

Nicholas Yura

nicholas.yura@us.army.mil

- **Product Director: Shipboard Collective Protection**

Richard “Chip” Warder

Richard.Warder@navy.mil

- **Product Director: Transportable Collective Protection**

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stephen.beaudoin@us.army.mil

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